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ATTITUDES TOWARDS THE USE OF COMPUTERS  
BY REGISTERED NURSES

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A Thesis  
Presented to the  
Faculty of  
California State University,  
San Bernardino

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Science  
in  
Nursing

---

by  
M. Luther Borgardt, RN  
March 2005

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BY REGISTERED NURSES


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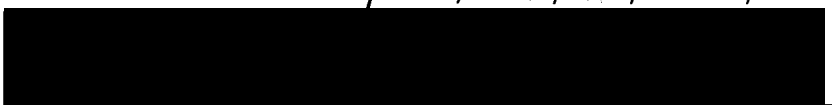
by  
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March 2005

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## ABSTRACT

Identification of attitudes towards the use of computers by nurses is important if effective professional clinical nursing practice is to occur. The purpose of this study was to describe the attitudes of a group of nurses towards the use of computers in a southern Californian Veterans Affairs hospital. The specific aims of this study included: 1) to identify and measure positive and negative attitudes towards computers and 2) to describe these attitudes related to demographic variables.

The theoretical framework for this study was based on Rogers' Diffusion of Innovation. The convenience sample was comprised of 80 Registered nurses. The research design allowed for collection of data utilizing a survey based on Stronge and Brodt's 1985 questionnaire.

Descriptive statistics were used to describe the data. Attitudes towards the use of computers were identified and compared to demographic variables. Conclusions drawn from the findings indicate that the participants had a somewhat positive attitude towards computers. Demographic variables had little influence as to whether a participant's attitude was either positive or negative. Recommendations were made for further research.

## ACKNOWLEDGMENTS

I would like to thank Dr. Susan Lloyd, RN, Dr. Ellen Daroszewski, RN, and Dr. Anita G. Kinser, RN, for advice and support for the study.

Special thanks the staff nurses and nurse managers who participated in and supported this research.

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## CHAPTER ONE

### INTRODUCTION

#### Background

In today's workforce, there are very few professionals who do not interact in some form or another with computers. Health care professionals are no exception. As technology advances, most nurses are being mandated to use computers in their profession, from administrative nurses to those who are responsible for direct patient care. Examples of computer usage include creating staffing schedules, determining patient care hours, time and attendance, and creating nursing policies. Many staff nurses are now using computers for the planning and documentation of patient care (Alpay & Russell, 2002).

The documentation of patient progress and care has always been important, but today it has assumed new importance with the current emphasis on monitoring the quality of health care as evidenced by patient outcomes and safety. Nursing documentation provides evidence of care and patients' responses to that care and is the essential link between the care the patient receives and the evaluation of that care. Documentation of nursing care is the foremost source of reference and communication

between nurses and other health care providers. It facilitates continuity of high quality care by keeping providers aware of patients' current health status (Helleso & Ruland, 2001).

But even though there is greater importance on nurses' charting, and despite technological advances, the use of patient-centered computer systems varies greatly from organization to organization. Computer usage is dependent upon factors such as available resources and the perceived importance of computers by administrators. Some hospitals, for example, only use computer applications to upload lab results for clinicians to review. Other facilities require nurses to complete their daily shift assessments via the computer. Still, other hospitals use computer applications for a complete electronic medical record (EMR), which includes charting medication administrations. Throughout the nation, most nurses use computers to varying degrees based on the software applications their facility directors have introduced (Dienemann & Van de Castle, 2003).

Quite often nurses have input as to the extent of participation they choose to use the computer. The scope in which nurses choose to use computers is a wide spectrum. Each individual nurse acts and reacts

differently to the computer and clinical software applications. For many nurses, the use of computers is viewed as a positive experience. Using computers relieves them from mundane clerical duties and assists with patient documentation. Other nurses do not always view computerization in a positive light. Many refuse to allow computers into their practice. They feel that computers are dehumanizing and are in direct conflict with the caring nature of nursing. Still, other nurses feel apprehensive and fearful of the new technology (Getty, Ryan, & Ekins, 1999). Whether or not a nurse has positive or negative feelings towards computerization, and despite how much support management offers, each individual nurse will always have input as to how he or she feels towards computers and to how the software application will be used.

Although most facilities do include staff nurses in the decision-making process, many front-line nurses do not have a choice as to which computer software applications are used. New software is often implemented with little buy-in. For example, less than 5 years ago, the nurses at many Veterans Health Administration (VHA) facilities, used Character User Interface (CHUI) based computers programs to retrieve lab values, enter vital sign data, write

progress notes, and manage some administrative duties. However, within most of these same facilities, the nurses are now required to use Graphical User Interface (GUI) applications to document all of their care, "note" provider orders, administer medications by scanning barcodes, and be Internet and Intranet savvy to view patient care related documents.

The literature describes the increased use of computerization for patient documentation as reducing medical errors, and thereby increasing patient safety (Neuenschwander, Cohen, Vaida, Patchett, Kelly, & Trohimovich, 2003; Smith, 2004). Errors in health care are a pressing problem, which, according to Bates, Cohen, Leape, Overhage, Shabot, and Sheridan (2003), is best addressed by changing our health care systems, most of which involves information technology. In 1999, the Institute of Medicine published an article entitled *To Error is Human*. In the report, the authors discuss the use of technology for reducing medical errors. Soon after *To Error is Human* was released, President Clinton challenged healthcare systems throughout the nation to reduce medical errors and increase patient safety through increased technology. Recognizing this need, the Veterans Health Administration initiated a major push towards the use of

technology, with the ultimate goal of reducing medical errors (Joint Healthcare Information Technology Alliance, 2000).

The data now show that information technology can reduce the number of medical errors. Strategies for preventing errors include software tools that can improve communication, make knowledge and information more readily accessible, require key pieces of information (such as the dose of a drug) when entering orders electronically, perform real-time safety checks, assist with monitoring, and provide decision support (Bates & Gawande, 2003).

Technology within the health care field is advancing at a phenomenal rate. New computer systems and software applications are being implemented at a feverish pace. For nurses, young and old, newly graduated or with years of experience, there has been a major paradigm shift in the way they document patient care. Mostly based on patient safety, technology has changed the "culture" of the nursing profession.

However, this technological and cultural shift has affected nurses in many ways. For many nurses (and other clinicians, as well), pen and paper documentation is a thing of the past. The tools for documenting patient planning, progress, outcomes, and medication



administration have become the keyboard, a mouse, and in some cases, bar code readers. Whether clinicians like it or not, the use of computers in health care settings has become standard practice (Alpay & Russell, 2002).

For many nurses, computers are a new phenomenon. Until the implementation of clinical software programs, many experienced nurses had never used one. By virtue of the chosen profession and the technological changes being mandated, their work environment has changed rapidly.

The use of computers in a clinical setting for newly graduated nurses can be just as troubling. Although many nursing programs require students to use computers for composing reports, care plans, and other assignments, many nursing schools do not teach students how to use clinical software programs. Simpson (2003) states many nursing programs have not incorporated this technology into their curriculum. If a nursing school were to do so, they would do a better job of simulating the clinical setting. Nurses and students who learn to navigate the electronic patient record will be better prepared for the clinical settings of today and tomorrow.

Regardless if the nurse is experienced, a novice, mature, or young, the new technologies have affected how nurses document. The attitudes of nurses towards the

computer are as varied as the individuals who hold these feelings.

Attitudes, whether positive or negative, towards computers impact the nursing practice. For example, the nurse with a positive attitude towards computers will more than likely feel more comfortable using one. Therefore, the ability to input or retrieve data may come easily. Feeling there is easy access to pertinent data, the nurse will be able to render the best possible care. In contrast, a nurse who has a poor attitude towards computers may be less comfortable and have difficulty locating the necessary information. Thus, there is a potential for providing less than optimal patient care. Another ramification related to nurses' negative attitudes towards computers is poor job satisfaction, which can lead to low recruitment and high turnover of staff (Dickerson, 2003).

#### Statement of the Problem

The VHA is the largest centrally directed health care system in the United States. It provides care in 172 medical centers, 850 community-based outpatient clinics and 137 nursing homes. In each of these facilities, the VHA has mandated that the use of the EMR be implemented

(Veterans Health Administration, 2004). Within this healthcare system there are approximately 33,000 registered nurses (VHA Nursing, 2003). Implementing the EMR was not an easy task. It began in 1997 and took approximately 4 years before every VHA site was using the electronic record (Veterans Health Administration, 2004). At many of these sites, there were nurses who had never used a computer. Many felt they wanted nothing to do with computers. This negative attitude towards computer usage was a contributing factor that persuaded many nurses to retired from the VA. For those nurses who opted to stay, they learned to live with the computer (Carroll, 2003). Some nurses accepted the new technology willingly, while other nurses did not. It has been 4 years since the EMR was implemented at the research site. Much like members of society in general, that accept or reject new ideas, some nurses have fully embraced and accepted the technology, while other nurses begrudging use the applications, and still others despise the computer. The spectrum of nurses' attitudes towards the use of computers is as varied as the individuals who use them.

Although nursing populations and the individuals within them are diverse as a whole, there were 3 main assumptions regarding the group of nurses connected with

this study. First, because the nurses have been using computers in a regular manner since 1999, they would have a positive attitude towards their use. Second, although the nurses do use the computers regularly, there is a generalized feeling that using computers detracts from patient care. Therefore, the findings of this study should indicate that the nurses' attitudes towards computers are poor with regards to patient care. Finally, the use of computerized technology for completing schoolwork has become the standard in so many educational institutions. So it was assumed that the nurses who recently completed their education would be more familiar with different computer applications. Consequently, they would have a deeper understanding of software applications, and that information would transfer over to the use of clinical applications. Thus, the nurses who recently completed their degree would have more positive attitudes towards the computer than those who finished years ago.

#### Purpose of the Study

The purpose of this study was to describe the attitudes of a group of Registered Nurses towards the use of computers in a southern California Veterans Affairs Medical Center. Specific aims of this study included:

1. To identify and measure positive and negative attitudes towards computers using an adapted tool based on the *Nurses' Attitudes Towards Computerization* questionnaire originally authored by Stronge and Brodt (1985).
2. To describe these attitudes related to demographic variables.

#### Limitations of the Study

This study only measured and examined the inpatient registered nurses' attitudes toward computers in a single Veterans Affairs Medical Center. This convenience sample of inpatient nurses in one hospital limits external validity. Therefore, the findings cannot be applied to all nurses within the research facility, nor can they be applied to the nursing profession as a whole.

#### Definition of Terms

For the purposes of this study, the following terms were defined as:

Attitude - "a predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein & Ajzen, 1975, p. 6).

Belief - "a dispositional mental property in that it tends to be accepting" (Audi, 1998, p. 276).

Character User Interface (CHUI) - A computer interface

that presents information to the user as text, and requires the user to type commands (known as command lines) via a keyboard to run software programs [see Graphical User Interface for comparison] (Information and Communication Technology for Language Teachers, 2004).

Computer Knowledge - knowledge and skills for computer operations (Staggers, Gassert, & Curran, 2002).

Computer Software - Computer software (or simply software) refers to one or more computer programs and data held in the storage of a computer for some purpose.

Program software performs the function of the program it implements, either by directly providing instructions to the computer hardware or by serving as input to another piece of software. Data software exists solely for its eventual use by other *program software* (Webster Dictionary.org, n.d.).

Diffusion - "The process in which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 474).

Graphical User Interface (GUI) - the graphical interface of a computer that allows users to click and drag

objects with a mouse instead of entering text at a command line [See Character User Interface for comparison] (Sharpened.net, 2004).

Innovation - "An idea, practice, or object perceived as new by an individual or social group" (Rogers, 2003, p. 475).

Motivation - the degree of need or drive for competency and self-determinism in behaviors (Carter & Kulbok, 2002).

Nursing Experience - clinical experience which is the factor of past experiences and its contribution to clinical knowledge. Clinical knowledge is a perceptual awareness that singles out relevant information from irrelevant, grasps a situation as a whole rather than a series of tasks, and accomplishes this rapidly and without incremental deliberative analysis of isolated facts or bits of information (Cioffi, 1997).

Nursing Documentation - documentation, either electronic or via pen and paper, that provides evidence of care and patients' responses to that care. It is the essential link between the care the patient receives and the evaluation of that care. Documentation of nursing care is the foremost source of reference and

communication between nurses and other health care providers (Martin, Hinds, & Felix, 1999).

Nursing Satisfaction - nursing satisfaction can be either positive or negative. Positive nursing satisfaction is related to perceived organizational commitment, communication with supervisor and peers, autonomy, recognition, and fairness. On the other hand, stress, routine, and personal locus of control has a negative association with job satisfaction. Other factors that affect nursing satisfaction include: organizational environment, the patient care experience, and managerial leadership skills (Chinnis, Summers, Doerr, Paulson, & Davis, 2001).

Social System - "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal" (Rogers, 2003, p. 23).

Veterans Affairs (VA) - The Department of Veterans Affairs, a cabinet level department within the Executive Branch of the United States Government. The Department of Veterans Affairs consists of 3 divisions: the Veterans Health Administration, the Veterans Benefit Administration, and the National Cemetery Administration (House Committee on Veterans Affairs, n.d.).



Veterans Health Administration (VHA) - One of the 3

divisions of the Department of Veterans Affairs. The VHA is one of the nation's largest healthcare providers. The VHA is made up of numerous outpatient clinics and 172 medical centers (Department of Veterans Affairs, n.d.).

Veterans Affairs Medical Center (VAMC) - Any one of the

172 main campuses throughout the nation in which healthcare is provided to America's veterans. All of the campuses are components of the VHA (Department of Veterans Affairs, n.d.).

## Theoretical Framework

### Diffusion of Innovation Theory

For many health care organizations, the implementation of using computers in the clinical setting is a formidable challenge. The transition from pen and paper to a keyboard and computer monitor can be emotionally disturbing and represents a significant change in workflow processes. This change not only affects the individual nurse, but it also affects the social unit of all who work within a particular nursing unit. The entire social system of the hospital organization will be affected. In order for the implementation of a

technological innovation, such as computer-based charting system, to be successful clinical staff must exhibit positive attitudes and acceptance (Hilz, 2000).

As a group, nurses represent the largest set of computers users in healthcare organizations. Therefore, nurses' attitudes and acceptance are major determining factors in whether a computer-based charting system will be successfully implemented and properly used (Hilz, 2000). Although there are many reasons why nurses accept or reject technological changes, there are ways to maximize the efforts. During the implementation, for example, staff development specialists can facilitate the correct use of the system and foster positive attitudes towards the use of computers. Once the system is successfully installed, the nurses' continued acceptance is still a factor. Software is continually being upgraded with new developments and enhancements. Nurses, who have gotten used to how a certain computer application works, are inundated with new features and developments. If acceptance of the technology is lost, using the computer properly can become too demanding for the nurse. Without continued positive attitudes and acceptance towards the computer, the thought of returning back to the days of pen and paper may be welcoming to many.

Everett Rogers' Innovation of Diffusion Theory is a useful tool to examine the process of change and the adoption or rejection of technical innovations such as a computerized charting system. In general, it examines the process by which an innovation is disseminated through social channels to members in a group or organization over time (Rogers, 2003). The theory consists of 4 main elements: the innovation, communication channels, time, and the social system.

#### Innovation

The "innovation is an idea, practice, or object perceived as new by an individual or social group" (Rogers, 2003, p. 475). 'Perceived' and 'new' are key words in this theory as related to the innovation. Based on past experiences, individuals perceive things in different ways. Past experiences are a major factor in how individuals are emotionally and psychologically shaped. The past experiences assist individuals to form judgments and gain knowledge (Fraser & Strang, 2004). Because people are individuals with different life experiences, perceptions regarding the same innovation will be different. 'Newness' is also based on past experiences and perceptions. For many, newness may be a discovery - never

having seen or heard of this new idea. For others, it may be that the idea has been around for years, but it has never been tried. Take for example, the metric system. Most adults know about the metric system, it has been around for many years. However, if it were put into everyday use in the United States, it would be a new innovation. Rogers (2003, p. 12) points out, that "[i]f an idea seems new to the individual, it is an innovation."

#### Communication Channel

The second element of Rogers' theory are the communication channels. These channels are important for spreading the information and knowledge of the innovation. They are "the process by which individuals create and share information with one another in order to reach a mutual understanding" (Rogers, 2003, p 18). The channels of communication come in many forms, from formal mass media, to individual discussions. The less personalized communication devices, such as mass media, are more effective in creating knowledge about the innovation (Rogers, 2003). For example, through the television advertising media, many Americans know that "Milk does a body good." Attitudes towards an innovation, on the other hand, are developed using more personal forms of

communication. Rogers (2003) states that most individuals do not evaluate innovations based on objective scientific research. Most are subjective evaluations gathered from peers who have already chosen to accept or reject the innovation. Within a social system, peers may act as role models who can influence others, either positively or negatively. However, on a larger scale, individual attitudes and behaviors are constrained to the norms and mores of the social system to which they belong.

#### Time

Time is the third element of Rogers' theory, and is involved in 3 different aspects of his theory; 1) the innovation-diffusion process, 2) the relative time in which an innovation is adopted by an individual, and 3) the rate of adoption through an organization or other social group. First, "[t]he innovation-decision process is the process through which a person passes from first knowledge of an innovation, to forming an attitude toward the innovation, to the decision to adopt or reject the innovation, to implement the new idea, and to confirmation of the decision" (Rogers, 2003, p. 170). The innovation-decision process (see Figure 1) is a time-ordered 5-step sequence in which an individual is

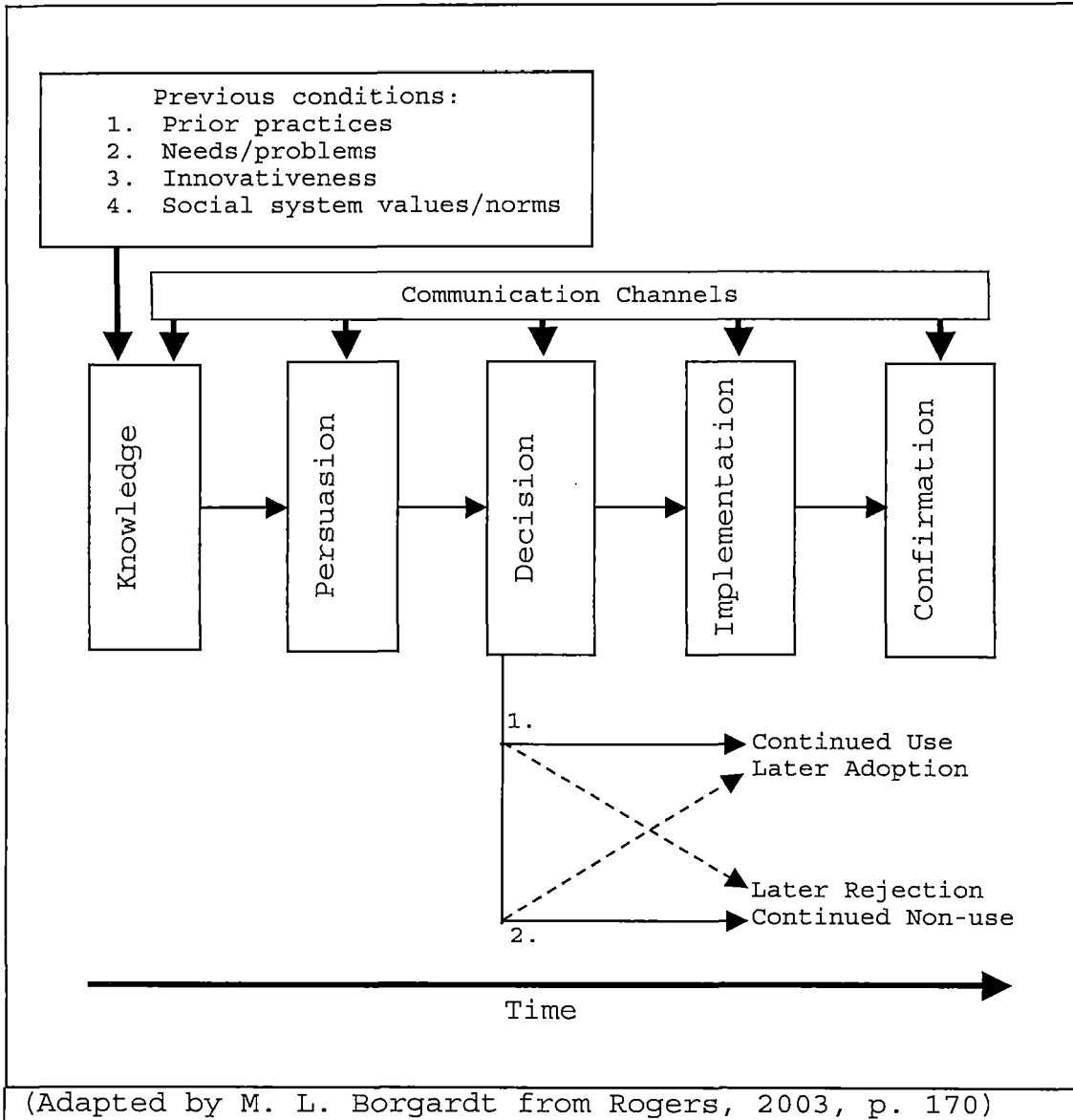


Figure 1. Rogers' Innovation-Decision Process

seeking and processing information in order to decrease uncertainty about an innovation's positive or negative consequences.

The first step or knowledge stage, is when the individual wants to know what the innovation is and how

and why it works. The knowledge stage is the cognitive stage of the mental processing of information about the innovation. The second step or persuasion stage is when the individual forms favorable or unfavorable attitudes towards the innovation. Attitudes toward an innovation are an enduring organization of a person's beliefs towards the innovation. As opposed to knowledge stage, the focus of the persuasion stage is the affective thinking towards the innovation (Rogers, 2003).

The decision stage of the process leads the individual to use the gathered knowledge and formed attitudes to either adopt or reject the innovation. Even though an innovation has been adopted, an individual may choose to discontinue the use of the idea or object at some later time. Conversely, if an individual rejects an innovation at first, he or she may choose to later adopt the new feature.

The fourth stage is implementation of the innovation. This is characterized by the acceptance and proper use of the innovation. Until this point in time, processes related to the innovation are mostly mental. This stage is where overt behavioral changes take place. Once the innovation has been integrated into workflow processes, the innovation loses its unique identity. When it has lost

its unique identity, the implementation stage is over (Rogers, 2003).

Finally, the confirmation stage is when the individual seeks validation for having adopted the innovation. For some, there may be psychological conflicts related to the adoption of the innovation. The confirmation stage represents the avoidance of internal conflicts within the individual, where he or she labors with some degree of ambiguity as to whether the decision to adopt the innovation was correct. Validation helps confirm the adoption of the innovation was the correct choice (Rogers, 2003).

'Innovativeness' is the second aspect in Rogers' theory in which time is involved. "Innovativeness is the degree to which an individual is relatively earlier in adopting new ideas than other members of the social system" (Rogers, 2003, p. 37). In other words, it is the degree of how willing the individuals are to adopt the innovation. Although innovativeness is on a continuum, Rogers (2003) places the adopters into 5 basic categories based on their willingness to adopt new ideas:

- 1) innovators, 2) early adopters, 3) early majority,
- 4) late majority, and 5) laggards. The distribution of individual adopters tends to follow a normal bell-shaped



curve (see Figure 2). Innovators make up 2.5% of the population; early adopters are 13.5% of the population; the early and late majorities both are about one-third of the population, at 34% each; and the laggards are about equal to 16% of the population (Rogers, 2003).

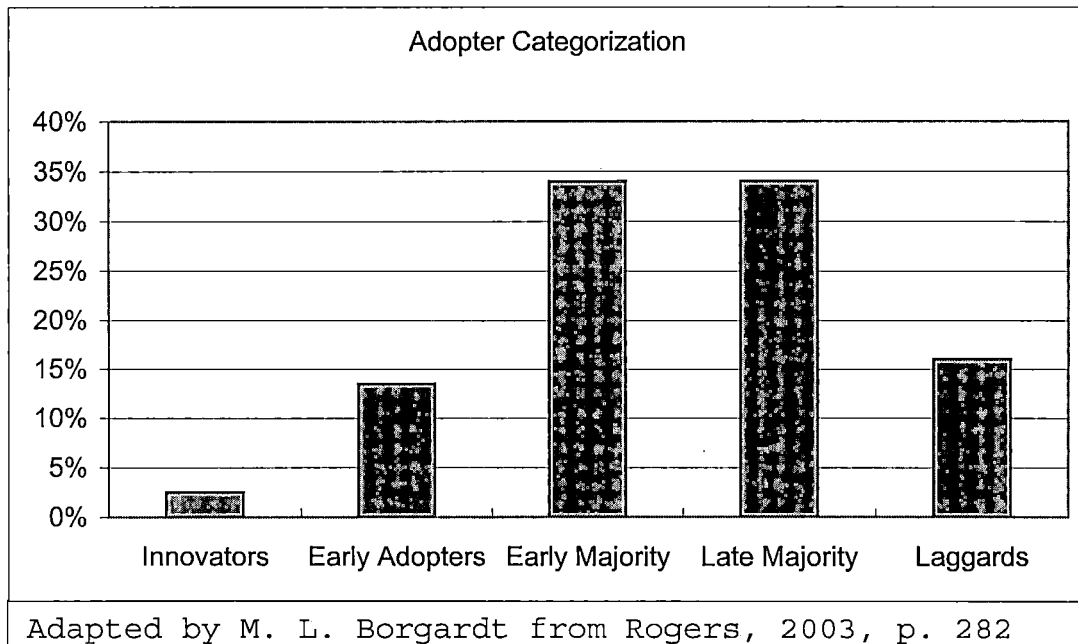


Figure 2. Adopter Categorization Based on Innovativeness

Generalized characteristics of each of the categories are as follows: Innovators are venturesome. These individuals tend to be daring and take risks. Many members of the social system do not respect innovators due to their risk-taking behavior. They are important, however, because they act as gatekeepers to allow new ideas to enter the social system (Rogers, 2003).

Early adopters are more mainstream and are more integrated into the social system than the innovators. The early adopters are individuals who are respected by his or her peers. This group of adopters has the highest degree of opinion leadership with a system. All the other potential adopters look to this group for information and advice about the innovation. Although they are only slightly ahead of most individuals in regards to their innovativeness, they are seen as role models for change. They help spark others within the system when they themselves adopt the innovation (Rogers, 2003).

The early majority is a group of individuals who are more apt to adopt innovations just slightly before the average member of the system. Although there is frequent interaction with their peers, individuals within this group hold no opinion leadership. These individuals will deliberate for sometime before completely adopting an innovation. Individuals within the early majority group follow with deliberate willingness, but seldom lead (Rogers, 2003).

The word that describes the late majority is 'skeptical.' This group approaches innovation with caution and skepticism, not accepting the innovation until most others within the social system have done so. For the late

majority, peer pressure is required. Before this group will adopt a new idea, most of the uncertainty must be removed (Rogers, 2003).

The laggards are the last members of the social group to adopt a new idea. This group possesses almost no opinion leadership. For most laggards, the point of reference is the past; traditional values are their guide. These individuals tend to socialize with others who hold like traditional values. Their adoption of new ideas lags way behind their awareness or knowledge of the innovation. Laggards tend to be suspicious of innovation and change (Rogers, 2003).

Finally, the third aspect in which time is used in the Diffusion of Innovations theory is the amount of time it takes for an innovation to be adopted by the members, as a whole, within a social system. The rate of adoption is not measured by individual, rather is it the rate of adoption within a system. The system can be a company, a community, or some other organizational structure. Adoption of innovations that are perceived by individuals as having a greater relative advantage may spread quickly within a system. On the other hand, the same innovation with the same relative advantages may spread at slower rates in different systems, based on social norms.

Although individuals play a major role in the diffusion of an innovation, systems too have their own values and norms, which may affect the diffusion of an innovation (Rogers, 2003).

### Social System

The final element of the Diffusion of Innovations theory is the social system. The members of a social system can be individuals, informal groups, organizations, and/or subsystems (Rogers, 2003, p. 23). The members within the social system cooperate to the extent of seeking to achieve a common objective. The sharing of a common goal is the factor that binds the social system together (Rogers, 2003).

In addition to the 4 basic elements of the Diffusion of Innovation theory, there are 4 attributes that adopters must perceive about an innovation in order for it to be adopted and to diffuse throughout the social system. Rogers (2003) points out that previous experience, the felt need of an innovation, the innovativeness, and the social system's norms play a major role in how an individual will perceive an innovation. Each of these 4 characteristics can help determine the rate of speed in which an innovation will diffuse within a social system.

The relative advantage of the new idea is the first attribute. This is the degree to which an innovation is better than the idea or object it supersedes. The relative advantage of a new idea answers the question, "What's in it for me?" If a potential adopter perceives an innovation as being disadvantage, there is less of a reason to adopt it. The rate of adoption within a system is positively correlated the perceived advantages the innovation will bring (Rogers, 2003).

The perceived compatibility of the innovation to the environment and individual is also necessary for adoption. Is the innovation compatible with the existing values, past experiences, and needs of the system? If not, then the adoption of the innovation will progress a slow rate, or possibly not at all. Like relative advantage, the perceived compatibility of an innovation with a system can be directly correlated to its rate of adoption (Rogers, 2003).

All innovations can be placed on a complexity-simplicity continuum. Depending on the perceived location of where this new idea lies on the continuum, will determine the rate of adoption. Although some new ideas are clearly understood by potential adopters, others are not. If an individual feels the new

idea is too complex to understand or use, adoption will be slow. Therefore, the perceived complexity of an innovation is negatively correlated to its diffusion throughout a social system (Rogers, 2003).

"Trialability is the degree to which an innovation may be experimented with in a trial basis" (Rogers, 2003, p. 258). When an individual is given the opportunity to experiment with a new innovation, he or she can give personal meaning to the new idea, determine how it works, and become connected with it. Unlike a forced implementation of an innovation, the ability for an individual to experiment and use it for a while leads to greater adoption (Rogers, 2003).

Finally, Rogers (2003) states that the observability of an innovation is necessary for its diffusion. Although some innovations are easily observed and communicated to others within the social system, other ideas are not. Some innovations cannot be seen or easily described. Rogers (2003) has found that the greater degree the innovation is observable, the greater rate of adoption within the system.

Rogers' Diffusion of Innovations is a broad social/psychological theory which helps explain and describes the patterns of adoption of new ideas. The

theory considers the 4 basic elements of the diffusion of innovations: the particular innovation, the channels in which the new ideas are spread, the length of time it will take for the innovation to diffuse throughout the social system, and the social system itself.

In general terms, a social system can be composed of sub-groups, organizations, or informal sub-sets; but when reduced to its smallest component, social systems are a collective of individuals. However, not all individuals within a social system are the same. Individuals within a group will not adopt or reject an innovation at the same rate. Based on the different individuals' past experiences, perceived needs or problems, and social norms, particular individuals will act differently towards the same innovation. Rogers (2003) points out that the rate of adoption or rejection is based on an individual's innovativeness. The distribution of individuals within the innovativeness-continuum is a normal bell curve, with the 2 extremes being the Innovators and the Laggards. Most individuals, however, fall within 1 standard deviation of the mean. The early majority is composed of individuals who fall just 1 standard deviation to the left of the mean, the group of individuals who make up the late

majority are 1 standard deviation to the right of the mean.

With an understanding of this theoretical framework, it can provide a powerful tool to determine if or when the adoption of a new idea has or will be been successfully implemented. The theory can offer reasons why some innovations are adopted slower than others, even though there is a seemingly relative advantage the social system. The theory can also be helpful in deciding what components will require additional effort, such as continued training, for the diffusion to become successful.

### Theory Application

#### The Innovation: The Electronic Medical Record

Changes in technology, like other changes in workflow processes, are in themselves neither good nor bad. They are, however, inevitable. In the recent past, the use of computers and technology within the health care environment has dramatically increased. With a primary emphasis on patient safety, there are other advantages to using the computer to access and enter data in an EMR. In some hospitals, waiting times for paper-based charts from the medical records department are nonexistent. Once the record has been made electronic, a clinician is only



seconds away from gathering vital information on the nearest computer screen. In addition, communication between departments is also increased. For example, imagine a physician is waiting for the results of a laboratory test to base her diagnosis and subsequent treatment of a critically ill patient. With some computerized systems, once the result of the test recorded, the physician is alerted electronically that the findings are available. Another advantage of the EMR is its legibility. Clinicians no longer have to decipher progress note entries, consultations, or medical orders. The computer has standardized the readability of all the entries into the record (Joint Healthcare Information Technology Alliance, 2000; Darbyshire, 2004).

#### Communication Channels

Although the VHA had begun using an electronic medical record since 1997, each of the 172 medical centers was under no national mandate to do so. Then in May of 2001, Under Secretary of Health for the Department of Veterans Affairs, Thomas Garthwaite mandated its full use across the VHA network (Garthwaite, 2001). Performance measures were created within the VHA to monitor each of the individual medical center's use of the EMR. Facility

executives and administrators were under pressure to fully implement the electronic record.

The formal communication channel was open. Individual facilities began massive marketing to and training of their clinicians. Committee meetings were held and information was disseminated. Informally, doctors and nurses began to talk. There were a lot of facts, rumors, and speculation heard in every department within the medical centers. Individual clinicians began to form opinions and attitudes based on the formal and informal conversations. From the time the innovation of the ERM was first revealed to the present, the formal and informal channels in which the information is distributed is an ever-changing process. The nurses gathered their information from administrators, managers, nursing educators, peers, and other clinical and non-clinical people alike.

### Social System

Rogers's (2003) states that social systems are comprised of many different types of members. They can be individuals, sub-groups, informal groups, and/or organizations. Within their daily lives, nurses are part of a social system. At work, nurses are members of many of these components. First, nurses are individuals, having

their own feelings, thoughts, and opinions. Many nurses work as part of a team with other nurses on the same nursing ward or in a clinic. In addition, these same nurses may have friends who work in the same facility, but not on the same team. All are components of the social system in which nurses belong.

Within these social groups, there are the accepted behaviors, norms, and mores. Even though the group is composed of individuals with independent thoughts and ideas, there are constraints placed upon the individual by the social group. If, for example, a group of nurses dress in a certain fashion, and a newly hired nurse comes to work in attire completely different from the others, she may feel compelled to never wear that outfit again. The same can be true regarding innovations. The social group of nurses may have a collective attitude that they do not like the new idea, so they do not want to use it. Although not as rapidly as individuals, social systems can and do change over time. What may have been an idea that was shunned by the group may now be fully accepted. Just as individuals and other member groups, social systems are always in a state of flux.

### Rogers' Innovation-Decision Process and Time

Regardless if a change is perceived as organizationally positive, as illustrated above, change can affect individuals or groups of people in different ways. For example, some individuals may experience feelings of achievement and pride when confronted with change. For others, change may bring uncertainty, ambiguity, and a loss of control and predictability (Curtis & White, 2002). If it is a cohesive group, similar feelings may appear with the social system. Curtis and White (2002) also assert that any change, positive or negative, planned or unplanned, requires the individual to readjust to his or her environment. An individual's past experiences and innovativeness will help determine how difficult the readjustment may be. If the individual is an innovator - a risk-taker, as described by Rogers (2003), the readjustment may be minimal. However, if the person is a laggard - basing his or her decisions on past values, the adaptation to the new idea may be extremely difficult. Because people are not alike, readjustments to and acceptance of the innovations will be different as well.

Adoption of an innovation is largely based on a person's belief or attitude toward the new idea. Looking back at the innovation-decision process, Rogers (2003)

points out that an individual's attitude plays a major role in moving from one stage to another. If an individual does not feel the innovation is relevant to him or her, the individual may never move out of the knowledge stage. He or she may know about the idea, but have no feeling either way because there is no relevance. For example, it may be the case that an operating room nurse knows about the new and unique machinery that dialysis nurses use, but because of its irrelevance to the operating room, no opinions or attitudes towards the machinery are formed.

On the other hand, if the innovation is significant to the individual, he or she will move to the persuasion stage. This is the point when attitudes towards the new idea are formed. For the nurses, this phase is when they will gather as much evaluative information as possible to reduce the uncertainty of the innovation. Much of the information that is gathered comes from past experiences and from other individuals within the social system (Rogers, 2003). Depending on the nurse's perception toward the innovation - in this study, computers - the attitudes may either be positive or negative.

Even though the attitudes towards the computer are formed, nurse must consciously make the decision to use them. In many instances the decision to adopt a new

innovation can be simplified. As a case in point, one of the primary missions of the Department of Veterans Affairs is to provide high quality patient care. The department decided that one way to provide this high quality care is through the use of the EMR. Therefore, within the VHA, the EMR has been integrated into its 172 hospitals throughout the nation (Veterans Health Administration, 2004). For many VA nurses the decision to adopt the innovation of the EMR was simple, either use the computers or resign. Rogers (2003) points out that even though a person has decided to adopt an innovation, the individual may still have a poor attitude towards it.

After deciding to adopt the use of the computer, the implementation stage is when the nurse begins using the innovation. Until this point for the VA nurses, the innovation-decision process had been strictly a mental exercise. However, implementation is when workflow processes change (Rogers, 2003). Again, with the VHA's mandate to integrate the EMR into the system, the VA nurses had little choice as to whether or not they would use the computer.

For the employees of an organization, the implementation of an innovation can cause extreme behavior changes. Imagine an experienced nurse with little or no

typing skills. With a pen and paper, his charting used to take 10 minutes per patient. But, without typing skills, it may take him 20 to 30 minutes to write a progress note. On the other hand, there may be another nurse who can type faster than she can write. For her, charting is done more quickly. Regardless of the positive or negative impact, behavioral changes were made during the implementation phase.

The confirmation stage of the process is when individuals seek support, either internal or external, for the decision to use and the innovation. The individual may choose to strengthen his commitment to the innovation or reverse it completely (Rogers, 2003). This is the stage where individual attitudes towards the computer can be maintained, reinforced, or changed. In the case of the 2 typists mentioned previously, the nurse with poor typing skills may have had a poor attitude towards using the computer from the outset. The fact that he takes longer to complete his charting may reinforce the negative attitude towards the computer. Alternatively, if the second nurse also had a poor attitude towards the computer from the onset, but realized that her typing skills afforded her more time for other nursing duties, her attitude towards the computer may become more favorable. In some cases,

nurses may come to fully embrace computers and hold positive attitudes towards their use. For others, the use of computers is felt to be complex and burdensome. Some nurses may continue to possess poor attitudes towards computers no matter how much they are used. In either case, attitudes are a force that Rogers (2003) uses to explain the drive to adopt and properly use an innovation throughout a social system.

Today's nurses live in a world of intense technological change. Now more than ever, the workplace environment is undergoing impressive and radical transformation. In an effort to increase patient safety and efficiency, enhancements in technology have consequently increased the volume of information, forms of communication, and speed of transactions (O'Connor, 2002). It does not matter whether the nurse has years of experience or is a new graduate, is young or elderly, or has earned an associates or masters degree, the rapid shifts and changes in technologies have caused nurses to adopt the new ideas and innovations. Whether the adoption by the individual is willing or reluctant, using Rogers' Diffusion of Innovations theory will shed light on areas requiring greater effort to ease the diffusion of the



innovation for the individual nurse as well as the nursing community as a whole.

## CHAPTER TWO

### LITERATURE REVIEW

#### Introduction

The literature review will describe the history of nurses using computers, how attitudes affect adult learning, how demographic variables affect attitudes, and finally, nurses attitudes towards computers.

Computer usage by nursing staff is described in the literature as a relatively recent phenomenon. When hospitals initially used computers, they were confined to administration and finance departments. But over the last 15 years, computers have been introduced into clinical areas. It had been suggested that computers in clinical areas would be great time-savers, enhance patient care, increase patient safety, and augment the nursing practice as a whole (Getty, Ryan, & Ekins, 1999; Joint Healthcare Information Technology Alliance, 2000).

Despite these positive attributes, the nursing profession has not wholly embraced the use of computers. For example, the advent of the new technology has led to an increased level of competency. The role of being a nurse now incorporates a need to be proficient in using computers that will enable them to access, manage, and

disseminate the data that develop from all this growing activity. Along with maintaining their clinical nursing skills, nurses must increase their education and training to enable them to use the new technologies. Although nurses continue to become more computer literate, a substantial number have not yet acquired adequate knowledge or comfort level to use them proficiently (Alpay & Russell, 2002).

### Nurses and Computers

During the post-Korean War years, hospitals began to implement information systems. These systems were mainly for administration and financial purposes. In the 1970s and 80s ancillary health care services, such as the laboratory, began to use computers to improve workflow processes and store data (Zytkowski, 2003).

In the late 1980s and early 1990s, the trend in information technology began to focus on improving the quality of patient care. Hospital-wide networks began linking departments and resources. In addition, large hospital databases led to the need for data warehouses, where data could be stored and retrieved. Clinicians began using the data to uncover trends in patient care. Additionally, information technology began to link all

health care service areas. Thus, it began increasing communication and enhancing patient safety (Zytkowski, 2003).

According to Hannah, Ball, and Edwards (1994), nurses were drawn to computers early on. They were the largest group of individuals who use computerized hospital information systems. In other words, nurses used computerized systems for patient care than any other health care professional. But, that was nearly 10 years ago, and many of the computerized clinical applications were relatively simple and archaic by today's standards. Recently, however, the rapid changes in technology have rendered many of the nurses' current skills and knowledge obsolete. As clinical software programs have become more complex, they have also placed new and different demands on the nurses. The nurse, who acts as a link between patients and technology, is required to be a competent knowledgeable professional individual who has the ability to use the electronic information and manage patient care (Koerner, 2003).

#### Attitudes and Adult Learning

Attitude is a key component of adult learning. According to Knowles (1984), as a person matures the

motivation to learn becomes internal. If nurses need to increase their computer knowledge and skills, it may be that they are lacking internal motivation to learn these necessary skills. As indicated by Learning Theory, there are 3 components that comprise the adult learning domain: cognitive (knowledge), psychomotor (skills), and affective (feelings). All 3 are inter-connected, and all are of equal importance (Krathwohl, Bloom, & Masia, 1964). Attitudes can foster interest and motivation to acquire knowledge and skills. Knowledge can be used to build attitudes and develop skills; and, as skills increase, knowledge and more positive attitudes increase with practice (Liu, Potiban, Lu, & Khamphonsiri, 2000). Therefore, attitudes can greatly affect, either positively or negatively, gaining knowledge and producing meaningful skills.

According to the literature, there is no exact agreed-upon definition of 'attitude.' However, many researchers agree with the conceptual definition of 'attitude' as "a predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein & Ajzen, 1975, p. 6). Fishbein and Ajzen state that this definition carries some ambiguity; however, within this definition there are 3

basic features: the notion that attitude is learned, that it predisposes action, and that such actions are consistently favorable or unfavorable toward the object.

Attitudes can affect the process of adult learning, both positively or negatively. As Scarpa, Smeltzer, and Jaison (1992) point out, positive attitudes enhance the learning experience; they increase the motivation to learn. On the other hand, negative attitudes obstruct the learning experience.

Behaviors, too, are strongly influenced by attitudes. Stronge and Brodt (1985) state that attitudes are the antecedent of behaviors, and that by understanding a person's attitude towards an object, one can understand the behavior towards that same object. Therefore, based on Fisnbein and Ajzen's (1975) definition of attitude, if the attitude towards a given subject is known, in this case - towards the use of computers, then it can be used with other variables, such as teaching techniques, to enhance a person's skills, behaviors, or knowledge.

#### Attitudes and Demographic Variables

Attitudes play an important part in workflow processes. They can help facilitate or hinder job performance. Attitudes are dependent on many social and

demographic factors. According to Darbyshire (2000), some of the variables related to nurses and their attitudes towards computers in a clinical setting include: age, ethnicity, experience as a nurse, gender, education, and computer experience.

In the last few years computers have become commonplace in American society, but not everyone owns or uses them. However, for those who do use computers, they are used at different skill and comfort levels. Take for example, nurses who have grown up in a world with computers. These younger nurses might view the technology as ordinary as television set, as easy to work with as pushing buttons on a remote control. Conversely, Carroll (2003) pointed out that more mature nurses may find computers difficult to understand and deem them as unnecessary and unwanted. Although not conclusive, other studies have indicated that older individuals have a somewhat unfavorable attitude towards computers (Dansky, Gamm, Vasey, & Barsukiewicz, 1999).

On the other hand, regardless of age, nurses who have used computers for quite sometime may have better attitudes towards them than nurses who have had little or no computer experience. Studies have shown that the more experience a nurse has with computers, the more likely his

or her attitude will be positive towards computers (Getty, Ryan, & Ekins, 1999; Marasovic, Kenney, Elliott & Sandhusake, 1997).

Another variable that may affect attitudes towards computers is the amount of nursing experience. Marasovic, et al., (1997) found that nurses who have a lot of experience have the point of view that they have worked well without computers, so, why do they need them? Additionally, they found that some nurses were unconvinced regarding the positive attributes of the new technology. Conversely, Brodt and Stronge (1986) found that nurses with more experience had better attitudes towards computers. They speculated that experienced nurses might feel that data within the EMR is more accessible. Thus, the nurse could provide better patient care.

The level of education may play a part in the variety of attitudes that nurses have towards computers. Registered nursing is a complex and varied field. Entry-level education into the profession can seem just a complex. Some registered nurses may have completed a diploma program before obtaining their license. This type of program is akin to vocational school or an apprenticeship, where the student nurse gains knowledge and experience while interning in a hospital. Other



registered nurses may have attend community college and earned a 2-year Associates degree. If the student wants a higher education, a Bachelors degree may be earned from a 4-year college. Regardless of which type of program is chosen, once a student has graduated, and passed a state licensure test, he or she is then considered a Registered Nurse (Valiga, 2003). Then, a registered nurse may continue with her educational goals; she may go on to earn a Masters and even a Doctoral degree (Inglis, 2004). With the varied educational levels that registered nurses have achieved, it is quite reasonable to suspect that it may have some bearing on their attitude towards computers.

Demographic variables have the potential to influence an individual's attitude towards any given object. As a person matures, he will gain knowledge through life's experiences. These experiences will become a resource for future learning (Knowles, 1984). Variables such as age, work experience, computer experience, and education level all play an important role in the formation of attitudes.

Knowledge related to this issue is an important concern because if it is determined that one or more of the aforementioned demographic variables leads to unfavorable attitudes towards computers, then supportive or corrective interventions may be implemented. For

example, if lack of computer experience or a specific education level is related to poor attitudes towards computers, then it might be possible to develop a curriculum where nurses can be supported and motivated to increase their computer skills, and thus, improve attitudes towards their use. Over time, creating positive attitudes towards computers may increase job satisfaction, which, in turn, may lead to more positive outcomes. Studies assessing employee job satisfaction and retention rates suggest that spending the time on creative learning increases the employee's job satisfaction and sense of value, which leads to higher recruitment and retention of quality staff (Dickerson, 2003; Nelson, 1999).

#### Nurses' Attitudes Towards Computers

There have been a number of studies examining the attitudes of nurses towards computers and computerization. One research paper clearly stands out as the benchmark; in their study, Stonge and Brodt (1985) created and tested one of the most widely used tools to measure the attitudes of nurses towards computers. The authors believed that nurses had poor attitudes towards computers and have, therefore, been resistant to their use, especially in regards to patient care. The purpose of the study was to

create a tool that will effectively measure the attitudes of nursing personnel towards computerization. The *Nurses' Attitudes Towards Computerization* or NATC is a 20-statement Likert-type scale that, according to the authors, is believed to be valid and reliable. The NATC correlated demographic factors, such as age, years of nursing experience, and educational background with the stated attitudes of the nurse subjects (Stronge & Brodt 1985). Then, in 1986 Brodt and Stronge (1986) administered the tool to 185 nurses. The results indicated that those nurses with a higher educational level and those with greater than 21 years nursing experience had slightly better ( $p < 0.05$ ) attitudes towards computerization than any other demographic factor. Factors such as gender, age, employment within a particular organization, and shift work showed no significant difference in the attitudes of nurses towards computers (Brodt & Stronge, 1986). The authors did not identify the degree of computerization within the hospital where the subjects were employed. Additionally, the authors did not examine the amount of time of the subject's computer experience.

Similar findings were reached in subsequent studies. The length of time within the nursing profession and higher educational preparation were the most significant

contributing factors that correlated to positive attitudes towards computers (Getty, Ryan, & Ekins, 1999).

However, other studies have found conflicting results (Burkes, 1991; Scarpa, Smeltzer, & Jaison, 1992; Ngin, Simms, & Erbin-Roesemann, 1993; Henderson & Deane, 1996; Marasovic, 1996). Burkes' (1991) work examined the attitudes of nurses towards computers, linking satisfaction and outcomes. She refined and modified the Stronge and Brodt (1985) NATC and named it the *Nurses' Computer-Use Attitude Questionnaire*. Unlike the Stronge and Brodt (1985) tool, which was developed to examine nurses' attitudes towards computers in general, Burkes' questionnaire was considered more sophisticated; it looked at attitudes towards specific computer applications.

Her study also looked at demographic variables such as the subjects' age, educational level, the amount of experience as a nurse, and computer experience. Using a sample of 133 nurses who had previously used computerized charting, Burkes was unable to find any positive correlations between demographic factors and attitudes. Interestingly, there were negative correlations found. Nurses with greater computer experience were less satisfied with electronic charting, while less computer experience correlated with greater satisfaction. In

addition, those with less nursing experience indicated greater satisfaction with computer charting than nurses with more professional experience. Again, the author did not identify the level of computerization within the hospital. This is an important variable; it has to do with workflow processes. For example, if the nurses used computers solely for documentation, they would have more practice, and quite possibly their comfort level may be higher. Thus, their attitudes towards computer might be more positive.

Scarpa, Smeltzer, and Jaison (1992) conducted a study in a large urban hospital. Their study discussed the attitudes of nurses prior to the implementation of computers in a non-computerized hospital. The sample included charge nurses, staff nurses, and licensed practical nurses ( $N = 136$ ). Using the Stronge and Brodt (1985) NATC, the authors discovered that nurses' basically had favorable attitudes towards computers. Looking across the demographic data in their study, the only significant difference they found was with nurses who had greater computer experience; the more experience, the more positive the attitude. There were no statistical differences reported with regard to age, years of education, job title, or years of nursing experience.

A different approach to using the NATC was taken in a study by McBride and Nagle (1996). Again, the authors used the Stronge and Brodt (1985) NATC; however, this study was designed to determine if there was a difference in attitudes towards computers between Registered Nurses (N = 394) and nursing students (N = 299). The Registered Nurse sample consisted of nurses employed in a large metropolitan hospital, where computers were not used for patient documentation or planning. The student sample was made up of students enrolled in a 4-year baccalaureate nursing program. The analysis of the data concluded that both Registered Nurses and nursing students have favorable attitudes towards computers. This is consistent with prior studies. Although the students had more experience with computers, most of it being with the use of word processors, there was no significant difference in mean NATC scores between the two groups. McBride and Nagle (1996) pointed out that even though the students may have more computer experience, their lack of actual clinical experience might have prevented them from understanding the advantages and disadvantages of using computers in the nursing profession.

Just prior to an implementation of a computerized information system in an Australian hospital, Marosivic,

Kenney, Elliott, and Sindhusake (1997) conducted a study to determine the attitudes of nurses towards computers. They believed that there is a strong association among the satisfaction, belief, and motivation constructs of an attitude. The authors used the questionnaire developed by Burkes (1991). The survey was given to the intensive care unit (ICU) staff (N = 47) in an attempt to determine the demographic factors that may produce positive and negative attitudes towards computers prior to the implementation. If factors that produce negative attitudes could be identified, then steps could be taken to intervene during the implementation process.

Marasovic et al. (1997) reached similar conclusions in this study, as with the previously cited studies. Those nurses with less nursing experience had the most positive attitudes towards computers and were the most likely to accept the introduction of a computerized information system. There was a less apparent association between computer knowledge and motivation to use the new system. The authors concluded that this might be because the less experienced nurses are more amenable to fundamental changes in their work practices. On the other hand, more experienced nurses may be more resistant to the impending change. Moreover, the authors believed that the more

experienced nurses might be skeptical about the advantages of the computerized system.

In the 1980s, the British government studied and began to put pressure on its Health Service to standardize health information gathering and use. Since that time, the British Health Service has been developing and implementing computerized information systems to be used within its service (Simpson & Kenrick, 1997). Simpson and Kenrick believed that the growth and implementation of the health information systems were not necessarily compatible with the nurses' professional beliefs. They also believed that the success of an implementation of an information system was directly related to the nurses' computer-related attitudes. Simpson and Kenrick (1997) published a study that examined two major themes: to determine the attitudes of British nurses towards computers, and then compare their study findings to Brodt and Stronge's (1986) findings in an attempt to determine the relevance of previous United States studies may have for British nursing.

Simpson and Kenrick (1997) used the Stronge and Brodt (1985) NATC in their study. The tool was selected on the basis of its demonstrated validity and use in many other studies. The authors used a convenience sample of 208



nurses who were employed in a British general hospital. This study established many conclusions not determined in previous related studies. It was the first attitude-related study to show that age was an important demographic factor. The nurses who were less than 29 years old had more positive computer-related attitudes than those nurses who were between the ages of 30 and 39 years old ( $p = 0.017$ ) and those nurses who were greater than 50 years old ( $p = 0.014$ ). Nursing experience was another factor that showed a difference as compared to Brodt and Stronge's (1986) study, but was consistent with other studies. Nurses with greater than 21 years experience showed the most negative attitudes towards computers ( $p = 0.017$ ). Other subtle differences between the two studies were noted, but not statistically significant.

Simpson and Kenrick (1997) believed that the differences between the two sets of findings could be attributed to the amount of time that has passed between the studies and the cultural difference between the United States and Great Britain. In addition, the authors stated that the ever-increasing use of information technology applications in everyday life might have affected the nurses' attitudes towards computers in a positive manner. In the last few years, there has a growing popularity to

use computers and software applications at home and for patient care management and documentation throughout many parts of the western world. During October of 2001, Webster, Davis, Holt, Stallan, New, and Yegdich (2003) conducted a replication of a Scottish study that was performed in the mid-1990s to determine the knowledge of and attitudes towards using computers of nurses and midwives in their clinical practice. This time Webster et al. (2003) conducted their study using Australian nurses and midwives. The authors adapted and used the questionnaire that was developed for the original Scottish study. The make up of the Australian sample (N = 590) included Assistants in Nursing (the equivalent of Nursing Assistants), Enrolled Nurses (similar to Licensed Vocational Nurses), and 5 levels of Registered Nurses.

This study too, was one in which the authors were investigating the attitudes of nurses towards computers. However, it was conducted just months after the implementation of an information retrieval system. Similar results as many of the previous studies were found. Overall, attitudes towards computers were generally favorable. The authors determined that the nurses with higher educations had better attitudes towards the computer. On the other hand, the authors also pointed out

that one of the biggest frustrations for the nurses during their data collection period was insufficient access to computers. Twenty-two percent of the nurses complained of the competition and waiting times to use computers (Webster et al., 2003).

There have been a number of studies that have examined the attitudes of nurses towards computers. In general, the studies have produced similar findings, that most of their subjects have a slightly positive attitude towards computers. However, as previously discussed, much of the prior research has discussed and evaluated the attitudes prior to or recently after the implementation of a new computer system (Brodt & Stronge, 1986; Burkes, 1991; Scarpa, Smeltzer, & Jaison, 1992; Henderson, & Deane, 1996; McBride & Nagle, 1996; Marosivic, Kenney, Elliott, & Sindhusake, 1997; Simpson & Kenrick, 1997; Getty, Ryan, & Ekins, 1999; Webster, Davis, Holt, Stallan, New, & Yegdich, 2003).

#### Summary of the Literature

When computers were first brought into hospitals they were limited to the administrative and financial departments. Only recently have they become a clinical phenomenon. When clinical software programs were first

created, many were simplistic and focused on one single function. However, with the rapid rate of technological changes many of the programs have become complex, with the ability to handle many tasks. Because nurses are the largest group of individuals who use clinical software, they are now being burdened with the duty of learning how to use the new technology.

Attitudes towards computers can be positive or negative. Based on one or more demographic variables, nurses may form positive or negative attitudes towards them. Some of the variables include: age, past experiences, or education. Positive attitudes may help the nurses learn the new skills. According to Learning Theory, nurses may be lacking the internal motivation to learn the new skills. Attitude, knowledge, and skills are all interrelated. As such, attitudes can greatly affect gaining knowledge and attaining skills, which can result in increased patient safety.

For nearly 20 years researchers have been examining the attitudes of nurses towards computers. Most have come to the conclusion that nurses are slightly favorable towards computers. Looking deeper into the data, analysis from some of the studies has correlated certain demographic variables with positive attitudes. Other studies have

shown the opposite; the same variable may lead to a negative attitude. When taken together, the reason for both positive and negative correlations from the same variable may be that much of the previous research was conducted prior to or shortly after the implementation of a computer system. Because the nurses had not used, or had only been using a particular computer system for a short time, quite possibly, the researchers may not have gotten accurate data from their respective samples.

Although there have been many studies that have examined nurses attitudes towards computers, most of the research was conducted where computers were used on a limited basis. Now that clinical computing is becoming more mainstream, it is important to continue to study the attitudes of registered nurses towards computers usage in a clinical environment with a mandated computer charting system to determine more accurately how attitudes towards computers impact patient care.

## CHAPTER THREE

### METHODOLOGY

This study used a non-experimental descriptive design to examine the attitudes towards computers by Registered Nurses in a Southern California Veterans Affairs Hospital. The intent was to identify both positive and negative attitudes among registered nurses who currently utilize a mandatory computerized charting system. A self-reported 20-item questionnaire with 7 questions regarding demographic variables was distributed to the participants. The respondents voluntarily completed and returned the questionnaire to the principal investigator.

#### Setting

This study was conducted at the Jerry L. Pettis Memorial VA Medical Center in Loma Linda, California during the winter of 2004.

According to the national census of 2000, Loma Linda, California has a population of 18,681. The racial makeup of the city is 54.18% Caucasian, 7.21% African, 0.49% Native American, 24.38% Asian, 0.18% Pacific Islander, 7.51% from other races, and 6.05% from two or more races. Hispanic or Latino, of any race, makes up 16.33% of the population. The age of the population is spread out with

21.9% under 18 years old, 10.2% from 18 to 24, 33.2% from 25 to 44, 19.2% from 45 to 64, and 15.4% who are 65 years of age or older. The median age is 34 years (Farlex, 2004).

The Loma Linda VA Health Care System is composed of the Jerry L. Pettis Memorial VA Medical Center and 5 outpatient clinics within surrounding communities in southern California (Loma Linda Healthcare System, para. 7, n.d.). The Jerry L. Pettis Memorial VA Medical Center offers outpatient and home care programs, as well as inpatient services. Inpatient services include Medicine, Surgery, Psychiatry, and Neurology. The facility is licensed for 97 acute care beds and has a 106-bed Nursing Home Care Unit (Loma Linda Healthcare System, para. 1, n.d.). The Loma Linda VA Health Care System provided 332,300 outpatient visits and 5,172 hospital admissions in the year 2000 (Loma Linda Healthcare System, para. 6, n.d.).

### Participants

The target population for this study consisted of employed Registered Nurses at the Jerry L. Pettis Memorial VA Medical Center in Loma Linda California, and who are

assigned to the inpatient arena. Participation in the study was by self-selection.

#### Instrumentation

A Likert scale, self-respondent instrument and a demographics information tool (see Appendix A) was adapted from Stronge and Brodt's (1985) *Nurses' Attitudes Towards Computers* (NATC) Survey was used to collect data related to registered nurses and their attitudes towards computers.

Based on the published literature on similar research, one survey tool seemed to stand out in the studies, the Stronge and Brodt's (1985) *Nurses' Attitudes Towards Computers* (NATC) Survey. Stronge and Brodt (1985) created this tool as an effective means of measuring the attitudes of nursing personnel towards computerization. After piloting their survey and making revisions, Stronge and Brodt's (1985) final version used 20 statements where the participants ranked each item using a 5-point Likert scale. The authors submitted the statements for an evaluation for content validity. An index of discrimination score was calculated for each item. The evaluation revealed that the survey was valid, with all of the items having an index of discrimination score of .50



or greater. In addition, the authors used the Spearman-Brown prophecy formula on each of the 20 items to determine the internal consistency of the tool. The resulting split-half reliability coefficient was  $r = .90$ . In addition to the 20 statements, Stronge and Brodt also include a demographic section with their tool, used to collect personal data from each of the respondents. Their demographic data included: age, sex, years as a nurse, highest degree in nursing, date of most recent degree, time of experience with computers, years worked at this hospital, and job title.

#### Likert Scale Attitudinal Tool

Based on the previous studies involving nurses' attitudes towards computers, an adaptation of Stronge and Brodt's (1985) NATC survey was judged to be the best fit for this research. However, the tool, in its original form, included statements that were deemed to be irrelevant to nurses at this Veterans Affairs Medical Center (VAMC); therefore, the questionnaire was adapted and some of the statements were replaced. For example, Stronge and Brodt's (1985) tool included the following statements: a) "only one person at a time can use a computer terminal and therefore, staff efficiency is

inhibited." Although it may be an issue at some facilities, it was not an issue for the nurses at this VAMC. As a case in point, in an 8-bed medical intensive care unit where there are a maximum of 4 nurses, there are 6 stationary workstations, 3 wireless mobile computers, and 4 hand-held computers. With this many devices there is no waiting time for the nurses or other clinicians to input or retrieve patient data; b) "computers increase cost by increasing the nurse's workload." Again, for many non-VA facilities, this may be an issue. However, billing at VAMCs is based on the hospital admission, not by supplies that are used or by the length of hospital stay; and c) "the more computers in an institution, the less jobs for employees." As a leader in the use of technology and the trend towards a 100% electronic medical record, there is a continual push towards the use of computers at VAMCs. Because of their experience, the nurses know that more computers does not equate to less jobs.

Also, when Stronge and Brodt (1985) developed the tool, they categorized the statements to reflect what they thought to be the major issues relating to computer use in the nursing profession. The authors felt that their questionnaire adequately covered the following topics: 1) job security, 2) legal ramifications, 3) quality of

patient care, 4) capabilities of computers, 5) employee willingness to use computers, and 6) benefit to the institution (Stronge & Brodt 1985). These 6 major themes were the subject of the content validity evaluation as previously stated. As a consequence of adapting the original questionnaire, only 3 of the original 6 themes were identified in the final version of the tool, 1) quality of patient care, 2) employee willingness to use computers, and 3) benefit to the institution (or employee development). In the final version of the adapted tool there were 3 statements related to patient care, 11 related to willingness to use computers, and 6 statements related to benefit to the institution or employee development.

In order to avoid response-bias of the 20 items, equal number of positively and negatively statements were included. The statements were randomly ordered within the questionnaire. An 'Additional Comments' field was also included so the participants could write any further remarks.

#### Demographic Data Collection Tool

Again, adapting the Stronge and Brodt (1985) tool to fit the particular needs of this study, demographic

information was gathered from each of the participants. The information included: 1) the participant's age, 2) the length of time the participant has been a Registered Nurse, 3) the participant's level of education, 4) length of time since the participant has earned his or her highest degree, 5) experience (in time) with computers, 6) the amount of time the participant has been working with the Veterans Health Administration, and 7) the participant's primary work location. In its original version, the Stronge and Brodt (1985) tool did include 'Sex' as a demographic factor. This factor was left off of the modified version because it was felt that by knowing the participant's sex, age, and primary work location, the identity of an individual participant could be inferred, especially one who was male. No other personal identifying data was collected. Dr. Stronge granted permission for the adaptation and use of the original tool for this study on January 13, 2004 (see Appendix B).

### Scoring

When Stronge and Brodt first developed the NATC, the tool was designed to contain 20 items related to the same attitude. Associated with each of the statements was a 5-point Likert scale for respondents to choose between

extremes (i.e. strongly agree to strongly disagree). Each of the statements was deemed to be of equal value. The value of each response for each of the statements was summed to yield an attitudinal score for each individual respondent. For the purposes of this study, scoring was calculated in the same manner. The summated scores from the respondents were categorized as follows: < 30 = very negative attitude towards computers, 31-50 = a negative attitude, 51-70 = an uncertain attitude towards computers, 71-90 = a positive attitude, and > 90 = a very positive attitude towards computers.

#### Pilot Testing

After Dr. Stronge's tool was adapted and prior to data collection, pilot testing was done to determine the interrater reliability and the tool validity. The tool was given to 9 Registered Nurses who were not part of the sample. The content validity was determined through a review of literature, a panel of Nurse Informatics Specialists, and the 9 original Registered Nurses who piloted the survey.

#### Approval Process

A protocol for this study (see Appendix C) was submitted to the Institutional Review Boards (IRB) at both

the Jerry L. Pettis Memorial VA Medical Center and the California State University, San Bernardino. Although this study involved human subjects, both IRBs waived the participation consent forms. Due to the lack of collection of identifiable data and benign nature of this study, it was deemed exempt from IRB review by both organizations. On January 12, 2004 the Veterans Affairs Research Committee granted approval to conduct the study (see Appendix D). On January 23, 2004, the Intuitional Review Board at California State University, San Bernardino gave their permission to perform the research (see Appendix E).

In addition, the Registered Nurses at the Jerry L. Pettis Memorial VA Medical Center work under the auspices of the United Nurses Association of California Union. The Union was informed of the study, and had given consent (see Appendix F) to conduct the research on December 22, 2003.

#### Procedure

Once all permissions were granted, a survey packet was created and distributed to all of the inpatient Registered Nurses (N = 150). The packet consisted of an introductory letter and consent (see Appendix G) with instructions for completing the survey and how to return

it, the questionnaire (see Appendix A), and a self-addressed envelope. A total of 150 surveys were distributed. The packets were given to the nurse managers for each inpatient ward and unit. The nurse manager then distributed the packets to his or her staff registered nurses. (In this facility, this is a normal way to distribute information to staff members.) Once completed, the registered nurses were asked to use the intra-facility mail system to return the surveys to the principal investigator. The registered nurses were given 2 weeks to complete and return the survey. Participation in the study was completely voluntary, as stated in the introductory letter. To maintain confidentiality, all of the returned surveys were stored in a secured location. All data was recorded in a database. Descriptions of the nurses' attitudes were extracted from the database.

#### Inclusion/Exclusion Criteria

All returned questionnaires would be included in the sample with the following exceptions:

1. Questionnaires where 2 or more of the Likert-type statements were left unmarked or were marked in a manner that was not understood what the respondent meant.

2. Questionnaires where 2 or more of the demographic data questions were left unmarked or were marked in a manner that was not understood what the respondent meant.
3. Questionnaires that were received past the 2-week deadline.



## CHAPTER FOUR

### FINDINGS AND RESULTS

#### Introduction

This study was a descriptive non-experimental study. Descriptive statistics were used to analyze the data using SPSS® version 12.

#### Presentation of the Findings

Participants included 83 (55.33%) VA inpatient Registered Nurses out of a total population of 150. All but 3 of the returned surveys were used for data collection. Two questionnaires were disqualified because they lacked sufficient demographic data, and did not meet the inclusion criteria as previously described. One questionnaire was not included because it missed the 2-week deadline. Based on the exclusion criteria, the final number of acceptable participants was 80 (53.33%).

#### Demographic Data

Table 1 provides a summary description of the incremental demographic characteristics of the participants (see Table 1).

Table 1. Incremental Demographic Characteristics of the Participants

Demographic Category	n	Minimum	Maximum	Mean	Std. Dev.
Age	78	25	66	47.6	9.123
Time as a Registered Nurse	79	5 months	43 years	17.9 years	1.81
The amount of time since earning the latest degree	76	1 month	40 years	11.4 years	10.5
Experience using Computers (Time)	72	5 months	30 years	8.45 years	6.62
Time as a VHA Employee	80	1 month	24.67 years	6.9 years	6.99

Table 2 provides a summary description of categorical characteristics of the participants (see table 2).

Table 2. Categorical Demographic Characteristics of the Participants

Category	n				
Highest level of Education	80	n = 3 Diploma	n = 26 Associates	n = 45 Bachelors	n = 6 Masters
Primary Work Environment	78	n = 23 Long-term Care	n = 31 Medical/Surgical	n = 20 Critical Care	n = 4 Psychiatric

#### Attitudinal Data

Table 3 categorizes the registered nurses, by number and percent as to their attitude towards computers (see Table 3).

Table 3. Participant Attitudes Towards Computers

	Very Negative	Negative	Uncertain	Positive	Very Positive
Scores	< 31	31-50	51-70	71-90	> 90
# of nurses	0	0	29	40	11
% of nurses	0.00	0.00	36.25	50.00	13.75

Actual percentage scores for each of the statements are displayed in Tables 4, 5, and 6. Each table represents statements grouped by thematic issues. Table 4 represents statements relating to Patient Care. Table 5 represents statements relating to Professional Development. Table 6 represents statements relating to willingness to use the computer.

Table 4. Participant Statements Related to Patient Care

	% SA	% A	% U	% D	% SD	n
Negatively Worded Statement						
14. Computers decrease time for patient care.	13.8	26.3	15.0	23.8	21.3	80
Positively Worded Statements						
3. I feel that using computers improves patient care.	37.5	33.8	13.8	6.3	8.8	80
20. It is easy to find patient data within the computer.	50.0	42.5	6.3	1.3	0.0	80

SA = Strongly Agree

A = Agree

U = Uncertain

D = Disagree

SD = Strongly Disagree

Table 5. Participant Statements Related to Professional Development

	% SA	% A	% U	% D	% SD	N
Negatively Worded Statement						
7. I feel that it is difficult to increase my computer skills.	5.0	3.8	12.5	48.8	30.0	80
Positively Worded Statements						
6. I am in control when I use the computer.	21.3	45.0	20.0	8.8	5.0	80
11. I ask for help if I don't understand the computer program.	53.8	42.5	1.3	1.3	1.3	80
12. I am a better nurse because of computers.	22.5	26.3	20.0	15.0	16.3	80
16. I feel that computers make my job safer.	28.8	37.5	8.8	13.8	11.3	80
18. I want to learn more about computers.	45.0	38.8	15.0	1.3	0	80

SA = Strongly Agree

A = Agree

U = Uncertain

D = Disagree

SD = Strongly Disagree

Table 6. Participant Statements Related to Willingness to Use Computers

	% SA	% A	% U	% D	% SD	N
Negatively Worded Statements						
4. I rarely feel relaxed when using a computer.	1.3	18.8	16.3	35.0	18.8	80
5. Nurses should not have to use computers.	3.8	3.8	6.3	30.0	56.3	80
8. I avoid using computers as much as possible.	0.0	6.3	7.5	41.3	45.0	80
9. I feel that computers are dehumanizing.	5.0	5.0	7.5	33.8	48.8	80
13. Time on the computer is out of proportion to the benefits.	17.5	15.0	16.3	27.5	21.3	78
15. I feel frustrated when using computers.	1.3	15.0	22.5	40.0	21.3	80
17. Computers put unnecessary burdens on nurses.	6.3	10.0	20.0	36.3	26.3	79
19. I don't like computers because they decrease communication between clinicians.	2.5	5.0	10.0	45.0	36.3	79
Positively Worded Statements						
1. I interact well with computers.	32.5	55.0	8.8	2.5	1.3	80
2. I like to use computers for things other than my job.	30.0	40.0	11.3	11.3	7.5	80
10. I like using the computer.	35.0	50.0	10.0	1.3	2.5	79

SA = Strongly Agree

A = Agree

U = Uncertain

D = Disagree

SD = Strongly Disagree

### Discussion of Results

In general, the participants had somewhat favorable attitude towards computers, which is similar to the results of other related studies.

### Demographic Data

The demographic data demonstrated the mean participant to be 47.4 years old, to have been a nurse for 17.9 years, to have been out of school for 11.4 years, to have 8.5 years of computer experience, and to have worked with the VHA for 6.9 years. The highest level of education for the majority of the participants was a Bachelors degree. Most of the participants worked in a medical/surgical area.

This indicates that the mean participant has been college prepared, was working with the VHA at the time of the computer system implementation, and has been using the computer within his or her daily workflow process since the implementation date. Based on the average response of 8.45 years of computer experience, and having used the VHA computer charting system as a daily work routine, it is remarkable that greater than one-third of the participants did not clearly indicate a positive attitude towards computers.

### Attitudinal Data

The attitudinal scores from the nurses ranged from 54 to 100, with a mean score of 76.8 and a standard deviation of 12.038, according to the scoring criteria. In general,

this indicates a somewhat positive attitude towards computers. The scoring results demonstrated that nearly two-thirds of the participants ( $n = 51$  or 63.75%) had a positive attitude towards computers. Although no single participant indicated that he or she had a negative attitude towards computers, greater than one-third ( $n = 29$  or 36.25%) were categorized as having uncertain attitudes. Stated more succinctly, one-third of the participants did not have positive attitudes toward computer usage.

#### Thematic Issues

Within the survey tool there were three thematic issues related to the attitudes towards computers:

- 1) patient care, 2) professional development, and
- 3) willingness to use the computer.

#### Patient Care

Examining the statements related to patient care, the participants were somewhat polarized when responding to the negatively-worded statement, "computers decrease time for patient care." Approximately 40% either strongly agreed or agreed with the statement and 45% either strongly disagreed or disagreed. The other 15% were uncertain.

Concerning the positively worded statements, the results indicated that 37.5% strongly agreed and 33.8% agreed that computers improve patient care. In addition, 50% of the participants strongly agreed and 42% agreed that it is easy to find patient data in the computer. Only 1.3% of the participants disagreed with this statement. Even though the negatively worded statement was somewhat polarizing, all 3 statements related to patient care did support positive attitudes toward computer use among the participants.

#### Professional Development

Participant responses related to both positively and negatively worded statements regarding professional development also supported positive attitudes towards computers. Thirty percent strongly disagreed and 48.8% disagreed that they felt it was difficult to increase computer skills. Most indicated that they felt in control when using the computer (21.3% strongly agreed and 45% agreed). The participants also indicated that they would ask for help if they did not understand a computer program (53.8% strongly agreed and 42.5% agreed), and many felt that they were a better nurse because of the computer (22.5% strongly agreed and 26.3% agreed). Most felt that



the computer made their job safer (28.8% strongly agreed and 37.5% agreed). Although only one participant stated that he or she did not want to learn more about computers, an overwhelming number of participants indicated that they did want to learn more (45.0% strongly agreed and 38.8% agreed).

### Willingness To Use Computers

Related to the theme of willingness to use computers, there were 8 negatively worded and 3 positively worded statements. Despite the number of negatively worded statements, all of the statements supported a positive attitude towards the use of computers. Many of the participants disagreed that they rarely feel relaxed while using a computer (18.8% strongly disagreed and 35% disagreed), and even more disagreed that nurses should not have to use computers (56.3% strongly disagreed and 30% disagreed). Most of the participants disagreed that they avoid using the computer (45% strongly disagreed and 41.3% disagreed). When responding to the feeling that computers are dehumanizing, the majority of participants disagreed (48.8% strongly disagreed and 33.8% disagreed). Although there was still a majority of disagreement that time on the computer is out of proportion to the benefits, the

disagreement was not as strong (21.3% strongly disagreed and 27.5% disagreed). A total of 32.5%, however, did agree that time on the computer is out of proportion of the benefits (17.5% strongly agreed and 15% agreed).

Concerning the feeling of frustration while using the computer, the participants disagreed that they have these emotions (21.3% strongly disagreed and 40% disagreed). The majority of the participants also disagreed that computers put unnecessary burdens on nurses (26.3% strongly disagreed and 36.3% disagreed). For the last negatively worded statement, most of the participants also disagreed that they do not like computers because they decrease communication between clinicians (36.3% strongly disagreed and 45% disagreed).

There were 3 positively worded statements relating to the willingness to use computers, and all supported positive attitudes towards computers. A large majority agreed that they interact well with computers (32.5% strongly agreed and 55% agreed). Seventy percent agreed that they like to use the computer for things other than work (30% strongly agreed and 40% agreed). Finally, when responding to the simple statement of whether or not the participant likes using computers, the vast majority agreed (35% strongly agreed and 50% agreed). There were

however 3.8% of the participants who disagreed with the statement (2.5% strongly disagreed and 1.3% disagreed).

### Sub-Group Analysis

Using the mean of the continuous demographic variables as a division, the data each of the variables was split in two, that which was greater than the mean and that which was less was then analyzed. For the categorical variables, a sub-group analysis was conducted for each category.

#### Age

The data included 78 responses from the participants. The mean age of all of the participants was 47.6 years old. There were there were 40 participants who were determined to be younger than the mean and 38 who indicated they were older. Examining the attitudinal scores of the sub-group that was younger than the mean to the sub-group that was older than the mean revealed nearly identical scores. The younger group had 6 participants with scores categorized as very positive, 20 with scores as positive, and 14 classified as uncertain. The older group had 4 participants categorized as very positive, 20 with scores in the positive category, and 14 as being uncertain. Essentially, this means that for this group of

participants, age had little or no influence as to the respondents' attitudes towards computer usage (see Table 7).

Table 7. Sub-group Analysis of Age

Age				
Total Participants (n = 78)		Mean Age = 47.6 years old		
	Younger than the mean		Older than the mean	
Participants	n = 40	51.3%	n = 38	48.7%
Attitude Towards Computer Usage				
Uncertain	14	35.0%	14	36.8%
Positive	20	50.0%	20	52.6%
Very positive	6	15.0%	4	10.5%

#### Experience as a Registered Nurse

A total of 79 participants supplied this information. The mean number of years of working as a registered nurse was 17.9. The number of participants having worked as a registered nurse for less than the mean was 44, while 35 participants had more experience. When comparing the more experienced to the lesser experienced, similar numbers towards their attitudes were discovered for both groups. The numbers of the less experienced group for the categories of very positive, positive, and uncertain were as follows: 6, 16, and 22, respectively. Although there were 9 less participants in the more experienced group,

the numbers for the 3 categories of very positive, positive, and uncertain were 4, 12, and 19, also respectively. Although other studies have stated that experience as a registered nurse did influence attitudes towards computers, the sub-group analysis of this demographic variable indicated that nursing experience had a very little role in their final score (see Table 8).

Table 8. Sub-group Analysis of Experience as a Registered Nurse

Experience as a Registered Nurse				
Total Participants (n = 79)		Mean years of experience = 17.9		
	Less than the mean		More than the mean	
Participants	n = 44	55.7%	n = 35	44.3%
Attitude Towards Computer Usage				
Uncertain	22	50.0%	19	54.3%
Positive	16	36.4%	12	34.3%
Very positive	6	13.7%	4	11.4%

#### Time Since Earning the Latest Degree

Only 76 participants chose to respond to this question. The mean number of years of the participants since earning their last educational degree was 11.4 years. Forty-eight of the participants indicated that they had finished their degree less than 11.4 years ago. For 28

participants, they had been out of school longer than the mean. Proportionally, however, the numbers within the 2 groups were similar. For the group who had finished their schooling less than 11.4 years ago, the categorization is as follows: 6 had very positive attitudes towards computers, 26 had positive attitudes, and 16 were uncertain. The findings for the second group included: 5 showed very positive attitudes, 14 were positive, and 9 indicated that there were uncertain. By comparing the 2 groups, there was nothing noteworthy to indicate that the length of time since earning a degree would influence either positive or negative attitudes towards computers (see Table 9).

Table 9. Sub-group Analysis of Time Since Earning Latest Degree

Time Since Earning Latest Degree.				
Total Participants (n = 76)		Mean years of experience = 11.4		
	Less than the mean		More than the mean	
Participants	n = 48	63.2%	n = 28	36.8%
Attitude Towards Computer Usage				
Uncertain	16	33.3%	9	32.1%
Positive	26	54.2%	14	50.0%
Very positive	6	12.5%	5	17.9%

### Computer Experience

A total of 72 participants supplied the number of years of computer experience each had. The average number of years of computer experience for all of the respondents was 8.45. Again, the total number of scores was divided into those having more computer experience than the mean and those with less experience. The number of respondents with less computer experience was 46, while 26 indicated that they had more. Attitudinal scores for the less experienced group were as follows: 3 indicated that they had a very positive attitude, 26 had positive attitudes, and 17 were uncertain. For the group with more experience, the numbers were 7, 12, and 7, respectively. The data show that those respondents with more computer experience had a little more positive attitude towards computer usage than the group with less experience (see Table 10).

Table 10. Sub-group Analysis of Years of Computer Experience

Years of Computer Experience				
Total Participants (n = 72)		Mean years of experience = 8.45		
	Less than the mean		More than the mean	
Participants	n = 46	63.9%	n = 26	36.1%
Attitudes Towards Computer Use				
Uncertain	17	37.0%	7	27.0%
Positive	26	56.6%	12	46.2%
Very positive	3	6.5%	7	26.9%

#### Time as a Veterans Health Administration Employee

All 80 of the participants provided the number of years they had worked for the VHA. The mean was 6.9 years. The number of participants with less than 6.9 years of VHA employment was 51 and 29 participants had worked longer. Of the group that had worked less than the mean, 6 were classified as having very positive attitudes towards computers, 27 were positive, and 18 were categorized as having uncertain attitudes towards computers. The data from the second group showed that 5 had very positive attitudes, 14 had positive attitudes and 10 were uncertain. Proportionally speaking, in both groups the attitudes of the participants was similar. The demographic variable of time being employed with the VHA had little or



no bearing as to the participant's attitude towards computers (see Table 11).

Table 11. Sub-group Analysis of Time as a Veterans Health Administration Employee

Time as a VHA Employee				
Total Participants (n = 80)		Mean years = 6.9		
	Younger than the mean		Older than the mean	
Participants	n = 51	63.8%	n = 29	36.2%
Attitudes Towards Computer Use				
Uncertain	18	35.3%	10	34.5%
Positive	27	52.9%	14	48.3%
Very positive	6	11.8%	5	17.2%

#### Highest Level of Education

All 80 participants disclosed their highest level of education. There were 6 who completed their Masters Degree, 45 had their Bachelors degree, 26 earned their Associates degree, and 3 were Diploma degree nurses. When examining both very positive and positive categories as a single group, all of the Masters prepared and Diploma degree nurses had positive attitudes, none were uncertain. The Associate and Bachelor degree nurses did display a slightly different outcome. For the Associates degree nurses, those with positive attitudes [very positive and positive combined] (n = 13) were nearly equal to those who

had uncertain attitudes (n = 12). On the other hand, for the participants with Bachelors degrees the number with positive attitudes (n = 30) was nearly double the numbers who were uncertain (n = 16). The number of participants with Diploma or Masters degrees was too small to determine a pattern. However, with this sample there was some indication that there is less trend of being ambivalent when the participant had earned a bachelors degree (see Table 12).

Table 12. Sub-group Analysis of Highest Level of Education

Highest Level of Education								
Total Participants (n = 80)								
	Diploma		Associates		Bachelors		Masters	
Participants	3	3.8%	25	31.3%	45	56.3%	6	7.5%
Attitudes Towards Computer Use								
Uncertain	0	0.0%	12	48.0%	16	35.6%	0	0.0%
Positive	3	100.0%	9	36.0%	24	53.3%	4	66.7%
Very positive	0	0.0%	4	16.0%	5	11.1%	2	33.3%

#### Primary Work Environment

Only 74 of the 80 participants designated their primary work location on the survey. There were 19 participants from Long-term Care, 4 participants worked on the Psychiatry unit, 31 were from the Medical/Surgical units, and 20 worked in the Intensive Care units. Although

it is difficult to compare the participants from the Psychiatry unit with the other participants due to the small number, this group was the most positive. One participant was very positive, 2 were positive, and only one was uncertain about the attitudes towards computers. When comparing the other 3 sub-groups, they were similar with regards to the amount of participants who were very positive (ranging from 10 to 16%), the positive group was approximately 50% (ranging from 50 to 58%). The medical/surgical and intensive care categories had approximately 40% of the participants who were determined to have uncertain attitudes towards computers, whereas only 26% of the participants from Long-term Care were uncertain. In general, the work environment did not seem to affect the participants' attitudes towards computer usage (see Table 13)

Table 13. Sub-group Analysis of Primary Work Environment

Primary Work Environment								
Total Participants (n = 74)								
	Long-term Care		Psychiatry		Medical/Surgical		Intensive Care	
Participants	19	25.7%	4	5.4%	31	41.9%	20	27.0%
Attitudes Towards Computer Use								
Uncertain	5	26.3%	1	25.0%	12	38.7%	8	40.0%
Positive	11	57.9%	2	50.0%	15	48.4%	10	50.0%
Very positive	3	15.8%	1	25.0%	4	12.9%	2	10.0%

#### Additional Comments

In addition to the analysis of the data from the Likert scale and demographic questionnaire, the following information was obtained from the returned surveys. Participants were given an opportunity to write any additional comments. Nineteen participants chose to do so. Below is a listing of the comments:

1. Spend more time with computers than patients
2. I need more practice with computers.
3. If I don't know I ask for help.
4. I would like more computer experience knowledge; time and work schedule limits me.
5. Ever since everything is computerized it does add burden to delivering patient care.

6. I dread the day I have to go back to a paper system. This system is phenomenal.
7. I like computers for the information but hating it because it takes time away from my patients.
8. Computer programs make nursing care difficult for nurses who have multiple nursing tasks to complete.
9. Frustrated because we are expected to know how to do so many things on the computer with little training. Enjoy it once it's learned. Trainers have been excellent; just need more individual of classroom time with them.
10. Computer is good and handy in most areas of reporting, but it should never have replaced documentation the old-fashioned way or taking care of our clients.
11. It would work better if it would work faster and not breaking down all the time.
12. At times we use more time in computer than patient care.
13. Computers slow down ICU's care!
14. Need space in the working area. Too crowded. Should be at patient bedside. Doctors should have separate room to work with computers.

15. My only concern is that computers here are ergonomically incorrect - monitors too high causing cervical strain.
16. More power to you! I get lost when there is computer downtime. Funny but it's time - I'm old in age, never had computers during my school, and at the height of my career. I wish there were computers back then.
17. Computers are great and improve interdisciplinary team communications.
18. Computers improve patient care with proper documentation done to alert all who are involved with patient care.
19. Computer programs like CPRS are great. Programs are where my frustration and dislike come from.

### Summary of the Findings

#### Demographic Data

Data collected from the participants indicate that the mean participant is 47.6 years old, has been a nurse for 17.9 years, and has been working with the VHA for 6.9 years. This indicates that the average participant has been using the VHA computer charting system on a daily basis since it was implemented in 1999. Although there

have been new employees within the facility since the implementation date, the data suggests the many of the participants helped to usher in the new charting system.

Related to age, the sample seems representative for the VHA as a whole. The average age of the registered nurses within the VHA nation-wide is 47.8 (VA Nursing, 2003). However, the VA Nursing website (2003) cites that of the 32,840 full-time registered nurses, 13.6% have earned their diploma degree, 22% have their Associates degree, 51.8% have obtained a Bachelors degree, 16.1% have their Masters degree, and less than 1% have earned their Doctorates degree. The sample for this study had greater numbers of participants who had attained their Associates (31.25%) and Bachelors degrees (56.25%) than the VA national average. There were only 3 (3.8%) participants who had received a Diploma degree, 6 (7.5%) had achieved their Masters degree, and none of the participants had completed a Doctorate program. There was no readily available national data related to the other demographic variables.

#### Attitudinal Data

The attitudinal data scored ranged from 54 to 100. The mean attitudinal score for the participants was 76.8, which indicates a somewhat positive attitude towards the

use of computers in a clinical setting. Based on the sub-group analysis, only one demographic variable seems to have been an influence as to whether or not participants had a more positive or more negative attitude towards computer usage. The data show that participants with more computer experience than the mean (8.45 years) indicated a slightly more positive attitude towards computers when compared to the participants having less than the mean number of years.



## CHAPTER FIVE

### CONCLUSIONS AND RECOMMENDATIONS

This chapter includes a summary of the research design as well as the findings, conclusions, implications for nursing practice, and recommendations for further research.

#### Summary of the Study

The purpose of this non-experimental, descriptive research was to examine attitudes towards the use of computers by registered nurses in a southern California Veterans Health Administration medical center. The research design allowed for the collection of data utilizing a Likert scale tool adapted from Stronge and Brodt's *Nurses Attitudes Towards Computers* survey tool (1985) to measure nurses attitudes towards computers. A demographic tool provided specific data on demographic variables. The convenience sample was composed of 80 registered nurses who work in Intensive Care units, Medical/Surgical wards, Psychiatry ward, or in a Long-term Care Facility.

The theoretical framework of the study was based on Roger's Diffusion of Innovation theory. In his theory, Rogers discusses 4 main elements (the innovation,

communication channels, time, and a social system), which relate to the diffusion and use of innovations. For this study, the innovation is the proper use of the computer charting system. The communication channels are the vehicles that disseminate the information the nurses need to gather about the innovation. The communication channels at the study site were both formal and informal.

The main focus of this study was examining a minute portion of the element of time in Rogers' theory. Time is essential element from when a person first learns of an innovation until it becomes a normal behavior for the social group. It is during this time when a potential adopter of the innovation begins to form opinions and attitudes towards the new idea. After implementation, as in the case of this study, time is factor that comes into play when non-adopters begin to see the benefits of the innovation and change attitudes towards it. Conversely, there may be adopters who have had a change in attitude and will, to some varying degree, discontinue the use or begin the improper use of the innovation. Thus, this study examined the attitudes towards computer usage by registered nurses at a given point in time to determine an aggregate attitude towards computer usage from the social group of registered nurses. This study also examined 7

demographic variables to determine if any or all had an influence on the participants' attitudes.

#### Limitations of the Design and Procedure

The main limitation of the survey may have been the questionnaire itself. It had not been used previously other than checking for validity and reliability. By adapting the Stronge and Brodt (1985) tool to fit the purposes of this study, poorly formulated or inappropriate statements may have been incorporated into the questionnaire. The original Stronge and Brodt (1985) NATC had been used in many studies. Several researchers who have used the instrument have felt it was valid and reliable (Brodt and Stronge, 1986; Burkes, 1991; Scarpa, Smeltzer, and Jaison, 1992; McBride and Nagle, 1996; Simpson and Kenrick, 1997).

In order for the questionnaire to be relevant for the subjects and their work environment, required changes were made to Stronge and Brodt's original tool. A panel was formed, which included 2 Informatics Nurses and 2 Information Specialists with extensive backgrounds in nursing. After some discussion and revisions regarding content validity of the statements, the final instrument for this study produced. Quite possibly, this group may

have chosen one or more statements that lacked validity of the attitudinal construct. By adapting the tool to fit this research some validity and reliability may have been lost.

Additionally, as with most self-administered surveys, the researcher had no control over who actually answers the questionnaire. Although each Registered Nurse had the opportunity to complete and return one questionnaire, because of the anonymity, there is no way of knowing who actually completed the survey. Also, the respondents may have read only part of the questionnaire before making a choice, thus potentially biasing his or her responses.

Another limitation to the methodology was the response rate. Of the 150 surveys that were distributed, 83 (55.33%) were returned. After discounting those that were disqualified, based on the exclusion criteria, the total percentage of acceptable questionnaires was 80 (53.33%). As with most survey-based studies, low response rate can influence the findings (Todd, 2003).

There was one variable that may or may not have influenced the nurses' responses. During the time when the nurses had possession of the questionnaires, there was an unplanned downtime in the computer system. This was an extremely abnormal situation for the facility in which

this study was conducted. On one day during the 2-week period, for approximately 10 hours, on an intermittent basis, the clinical software applications (patients' charts and charting systems) were not available to the clinicians. Because of the difficulties during this time, the participants may have recorded more positive attitudes towards the computer system. The nurses may have gained a new insight as to how dependent on computers they have become. Even though contingency plans were in place, it was a difficult time to transition to different workflow processes.

Additional biases may have also influenced the sample group. The nurses who participated in this study have worked with and know the author rather well. Based on the information provided in the introductory letter that accompanied the questionnaire, the participants may have wanted to "help" the researcher, thus possibly skewing the data either one way or the other.

#### Assumptions Prior to the Study

There were 3 basic assumptions important to the study. First, all of the cited literature reported nurses had only a somewhat favorable attitude towards computers. However, these studies were conducted prior to or just

after an implementation of a computer program or system. Only Liu et al. (2000) conducted their study 1 year after the implementation of a software system. The overall attitudes in her study showed that the nurses still only had a slightly favorable attitude towards computers. Because the subjects in this study had been using a GUI-based computer system for more than 4 years and been more familiar with the system, it was assumed that their attitudes towards computers would be more favorable than the previously cited studies.

In addition, it was believed that the participants would claim to have an unfavorable attitude towards computer use based on the thematic statements related to patient care. Anecdotally, a common complaint that is heard is that the nurses do not have enough time for patients because they are always using the computer. They are using computers to review significant patient data, enter data, write progress notes, and administer medications. When comparing computer usage today versus 5 years ago, the nurses do spend much more time with computers. But, does computer usage detract from patient care? Anecdotally, one may believe so. However, that is a subject for further research.

Finally, it was also assumed that those nurses who had recently finished their degrees would have a better attitude towards computers. This assumption was based on modern educational requirements. In these times of technological and information expansion, many students are now required to complete educational assignments with a computer. By using computers and becoming more familiar with them, it was believed that the nurses who recently completed an educational degree would have better attitudes towards their use.

## Findings

### Demographics

A descriptive analysis of the participants was conducted. The demographic data showed that the mean participant was 47.6 years old, to have been a registered nurse for 17.9 years, to have been out of school for 11.4 years, to have 8.5 years of computer experience, and to have worked for the VHA for 6.9 years. The majority of participants had their Bachelors degree. Most of the participants worked in the Medical/Surgical wards.

### Attitudes

Based on the scoring criteria, the attitudinal data scores ranged from 54 to 100, with a mean score of 76.8.

This score indicates a somewhat favorable attitude towards the use of computers.

### Research Conclusions

A sub-group analysis was performed based on the demographic variables with regard to the attitudinal scores. For the continuous variables, the mean was used as a division. The sub-group above the mean was compared to the sub-group below the mean. Only one of the variables - the amount of computer experience - had shown to have a positive influence on the participants' attitude towards the use of computers. The categorical variables had little or no influence on the participants' attitudes whatsoever.

Although the results of the research indicate that the participants had somewhat of a positive attitude towards computers, there was no indication that the prior assumptions were true. The continued use of the computer for 4 years did not seem to sway the participants one way or the other when compared to the previously published literature. The general attitude of the nurses was similar to all of the previous studies. Even the anecdotal complaint that computers take time away from patient care was shown not to be true (see Table 4).



Regardless of the limitations of this study, the data is still relevant. Although not generalizable to the nursing community as a whole, the results are applicable to the facility in which the study was conducted and may be utilized to improve the training process.

### Implications for Nursing Practice

Despite the assumptions and the findings, there is subjective evidence that indicates many VHA nurses throughout the nation do not fully comprehend computers in general and, more specifically, the computer programs they are required to use. A review of a particular VHA facility's help desk records suggests that, even though formal training has taken place, some nurses will call for assistance repeatedly with the same types of problems. Further anecdotal evidence indicates that many nurses lack the skills necessary to troubleshoot the problems they encounter while using computers. Though they may understand nursing, many of the nurses still have difficulty making the nursing-computer connection.

In order to correct the learning deficits, nurses will have to spend more time learning about computers and being trained on specific software programs. In many ways the nursing profession is very much like it was in the

time of Florence Nightingale, with the main focus being on patient care. But new technology has forced the nursing profession to make changes. For many nurses, using computers are an inevitable fact. Therefore, in addition to learning and maintaining clinical nursing skills, nurses will have to learn and maintain proper computer skills.

#### Implications for Nursing Administration

One of the goals of any administrative team is to help the employees be as efficient as they can. Nursing administration is no different. They want their employees to have the best tools to facilitate patient care as much as possible. A computerized clinical charting system is one of the tools. It allows for easy patient data retrieval in a legible format. Because information is readily available and is easily read, fewer medical errors are made. Fewer errors equate to a more productive workflow. Thus, the nurses are more efficient in caring for their patients.

This seems like a simple formula. But, what is left out of the equation is time. In order for the nurses to become efficient using an electronic medical record, they need time. They need time to attend training, time to

practice, and time to become fully competent with the system.

The results of this study showed that, in general, the nurses had a somewhat favorable attitude towards computers. However, the data also showed that greater than one-third (36.25%) of the participants were uncertain as to their attitude. In other words, greater than 1 in 3 of the participants did not have favorable attitudes towards computers. Imaging the difficulties a nurse has during his or her normal shift, then add to that the mandate of using a tool, in this case computers, that he or she does not like to use.

For nursing administrators, this can be a real problem. The nurses are not working as efficiently as possible, frustration levels may rise, and retention levels may decrease. In order to correct the problem, remedial and continued computer training must be given to the nurses. However, the problem lies in getting the nurses the training they need.

Training takes time, and time is money. Administrators have 2 choices: either 1) increase staffing levels so that some nurses can be trained while the others continue with patient care or 2) pay the nurses overtime so they can attend training outside of their regular

working hours. With the recent nursing shortage and tight budgets, neither option is a pleasant choice for administrators. This may cause the administrators to have to become more creative with their budgets and training plans. The age of computers is here, and it has invaded the nursing profession. In order to increase competency levels with the new technology among nurses, nursing administrators will need to remove the barriers to gaining knowledge. More time and financial resources will have to be spent on developing educational programs and providing nurses access to training.

#### Recommendations for Further Research

Research in this field should continue. Returning back to Adult learning Theory and the interconnectedness of attitudes, knowledge, and behaviors, it would probably be wise to spend more time examining not only nurses' attitudes, but the their computer knowledge and skills. It might be the case that their lack of skills is raising barriers to having positive attitudes. On the other hand, having a limited knowledge of how computers or software applications work may affect a nurse's behaviors and/or attitude.

Attitudes are a critical element of what motivates nurses. Motivation leads to behavior, and both are interconnected with knowledge. Positive attitudes towards the computer are a key determinant in fostering successful computer learning and skills attainment. These days, information systems are a critical resource for providing information essential to supporting patient care, administrative operations, and strategic decision-making. Additionally, there are many factors that determine the direction of emerging health care technology, including new laws that mandate how nurses are expected to protect and distribute patient information. In today's health care systems, the nurse and computer are inseparable. Although nursing is a people-oriented profession, by not having a positive attitude towards computers the practice is diminished.

APPENDIX A  
SURVEY INSTRUMENT

## A Survey to Determine a Registered Nurse's Attitude Toward Computers

Instructions: Read each of the 20 items below. Circle the response that best reflects your attitude towards the statement. Please fill out the demographic information on page 2.

1 = Strongly Agree    2 = Agree    3 = Uncertain    4 = Disagree    5 = Strongly Disagree

1. I interact well with computers.	1	2	3	4	5
2. I like to use computers for things other than my job.	1	2	3	4	5
3. I feel that using computers improves patient care.	1	2	3	4	5
4. I rarely feel relaxed when using a computer.	1	2	3	4	5
5. Nurses should not have to use computers.	1	2	3	4	5
6. I am in control when I use the computer.	1	2	3	4	5
7. I feel that it is difficult to increase my computer skills.	1	2	3	4	5
8. I avoid using computers as much as possible.	1	2	3	4	5
9. I feel that computers are dehumanizing.	1	2	3	4	5
10. I like using the computer.	1	2	3	4	5
11. I ask for help if I don't understand the computer program.	1	2	3	4	5
12. I am a better nurse because of computers.	1	2	3	4	5
13. Time on the computer is out of proportion to the benefits.	1	2	3	4	5
14. Computers decrease time for patient care.	1	2	3	4	5
15. I feel frustrated when using computers.	1	2	3	4	5
16. I feel that computers make my job safer.	1	2	3	4	5
17. Computers put unnecessary burdens on nurses.	1	2	3	4	5
18. I want to learn more about computers.	1	2	3	4	5
19. I don't like computers because they decrease communication between clinicians.	1	2	3	4	5
20. It is easy to find patient data within the computer	1	2	3	4	5

Additional comments: \_\_\_\_\_

**PLEASE COMPLETE THE DEMOGRAPHIC PORTION ON THE BACK**

## A Survey to Determine a Registered Nurse's Attitude Toward Computers

### Demographics:

1. Age: \_\_\_\_\_
2. How long have you been a Registered Nurse? \_\_\_\_\_ years \_\_\_\_\_ months
3. Highest Level of Education (check one):  
\_\_\_\_ RN – Diploma  
\_\_\_\_ RN – Associates Degree  
\_\_\_\_ RN – Bachelors Degree (any)  
\_\_\_\_ RN – Masters Degree (any)  
\_\_\_\_ RN – Ph.D. (any)
4. The amount of time since you earned your latest degree  
\_\_\_\_\_ years \_\_\_\_\_ months
5. How much experience do you have with computers:  
\_\_\_\_\_ years \_\_\_\_\_ months
6. The total time you have been working for the Veterans Health Administration:  
\_\_\_\_\_ years \_\_\_\_\_ months
7. Primary work location (e.g., 4SW, CCU, 2NE, etc.): \_\_\_\_\_

Thank you for your participation.

Stronge, J.H. (1985) Assessment of nurses' attitudes towards computerization. *Computers in Nursing*. (3) 154-158. Adapted, with permission, by Borgardt, M.L. (2004)



APPENDIX B

EMAIL GRANTING PERMISSION FOR USE AND ADAPTATION

OF THE SURVEY INSTRUMENT

-----Original Message-----

**From:** Borgardt, Luther  
**Sent:** Tuesday, January 13, 2004 8:06 AM  
**To:** 'jhstro@facstaff.wm.edu'  
**Subject:** Seeking information and permission

Allow me to introduce myself, my name is Luther Borgardt, RN. I'm graduate student working towards my Masters of Science in Nursing at California State University, San Bernardino. The information that I am seeking is to determine if, in fact, you are the author of the article, "Assessment of Nurses' Attitudes Toward Computerization"? It was written by James H Stronge, Ph.D., with co-author Ann Brodt. The article was published in *Computers in Nursing*, July 1985.

If you are the author, the permission I am seeking is to use the tool that was developed for that study. I am writing a thesis for my Masters program and would like to use a survey based on the tool. A few of the questions on the original tool do not pertain the to the nurses that I would like to study; however, I'd like to adapt it to fit my needs. Thank you very much for your time.

Luther Borgardt, RN

-----Original Message-----

**From:** James Stronge [mailto:jhstro@wm.edu]  
**Sent:** Tuesday, January 13, 2004 8:55 AM  
**To:** Borgardt, Luther  
**Subject:** Re: Seeking information and permission

Mr. Borgardt,

I am the author of the questionnaire. You may consider this message as permission to use the instrument for your study. If you prefer a more formal permission, please send me a letter with a place to sign permission, along with a return envelope, and I will forward it.

Best wishes.

James Stronge

The College of William and Mary  
School of Education  
P.O. Box 8795  
Williamsburg, Virginia 23187-8795  
757-221-2339

APPENDIX C  
STUDY PROTOCOL

# **Determining the Attitudes of Nurses Towards the Use of Computers.**

By M. Luther Borgardt, RN

## **PROTOCOL**

### **INTRODUCTION**

Attitude is a key component of adult learning. It can affect the process of learning positively or negatively. At the Jerry L. Pettis Memorial VA Medical Center, computers are used extensively throughout the facility, and have been since 1999. Even though computers are widely used in this hospital, anecdotal evidence gathered by Information Technology Service staff members suggests that many Registered Nurses (as well as other staff members) do not fully comprehend the basic and clinical use of the facility's computer system. There are many factors that may contribute to this lack of understanding: the need for training, having no time to attend training, generalized computer illiteracy, and the scarcity for resources to name a few. However, underlying these barriers to understanding the computer might be the nurses' personal attitude towards using the computer system. In other words, there may be a lack of intrinsic motivation and self-direction to learn basic or new computer skills.

This proposal is to conduct a descriptive study to determine the attitudes of Registered Nurses towards the use of computers. It will take place in Jerry L. Pettis Memorial VA Medical Center during the winter of 2004. Depending on the results of the survey, it may be possible to positively intervene to increase the users' comfort and satisfaction with the computer system.

### **SAMPLE**

The sample will consist of individuals who are Registered Nurses and employed at Jerry L. Pettis Memorial VA Medical Center, and working in the inpatient arena. Participation in the study is completely voluntary.

### **METHOD**

#### Survey:

To determine the attitudes of Registered Nurses towards computers, a survey will be used. The survey consists of 20 statements where the subject will use a Likert-type scale to indicate how he or she feels about each statement. The scale is made of five possible choices: 1) SA, Strongly Agree; 2) A, Agree; 3) U, Uncertain; 4) D, Disagree; and 5) SD, Strongly Disagree. Ten of the statements are positively worded, while the

other 10 are negatively worded. In addition to the 20 statements, demographic data will be collected, to include: 1) age, 2) length of time the subject has been a Registered Nurse, 3) the subject's level of education, 4) length of time since the subject has earned his or her highest degree, 5) experience (in time) with computers, 6) the amount of time the subject has been working with the Veterans Health Administration, and 7) the subject's primary work location. No personal identifying data will be collected.

#### Distribution and Return:

A survey packet will be created and be distributed to Registered Nurses, who are working with inpatients within the Jerry L. Pettis Memorial VA Medical Center. The packet will consist of an introductory letter with instructions for completing the survey and how to return it, the survey, and a self-addressed envelope. A total of 100 surveys will be distributed.

The packets will be given to the nurse managers for each inpatient ward and unit. The nurse manager will then distributed the packets to his or her staff Registered Nurses. (In this facility, this is a normal way to distribute information to staff members.) Once completed, the Registered Nurses will be asked to use the facility's mail system to return the surveys. The Registered Nurses will be given 2 weeks to complete and return the survey. There are no anticipated risks associated with the survey.

After all of the data is compiled and analyzed, mechanical shredding will be used to destroy the returned protocol surveys.

#### Analysis:

Descriptive statistics will be used to analyze the data once it has been collected.

#### Funding:

All funds used for this study, to include paper, envelopes, and printing, will be paid by the principal investigator.

#### UNAC Concerns:

A copy of the protocol, introductory letter, and protocol survey was delivered to a representative of UNAC. After verbally discussing the project and answering any questions, Frances Abad, RN, UNAC Secretary granted permission, on 12/22/03, for the Registered Nurses within the Jerry L. Pettis Memorial VA Medical Center to take part in the study if they so choose. Copies of the aforementioned documents will be kept on file in the UNAC office.

APPENDIX D

VA LOMA LINDA HEALTHCARE SYSTEM INSTITUTIONAL

REVIEW BOARD APPROVAL

**Institutional Review Board (IRB)**  
**VA Loma Linda Healthcare System - 605**  
**Research Service (151)**

11201 Benton Street • Loma Linda, CA 92357 • 909-422-3050 • Fax: 909-796-4508

**Report of Institutional Review Board (IRB)**

Project/Program Title: **Determining the Attitudes of Registered Nurses Towards the use of Computers**

Principal Investigator: **M. Luther Borgardt, BSN**

VAMC: **Loma Linda**

Review Date: **01/07/2004**

Items Reviewed: **Research Protocol (12/23/2003)**

**COMMITTEE FINDINGS:**

1. The information given in the Informed Consent under the Description of Research by Investigator is complete, accurate, and understandable to a research subject or a surrogate who possesses standard reading and comprehension skills. ☐ Yes ☐ No ☒ N/A
2. The informed consent is obtained by the principal investigator or a trained and supervised designee under suitable circumstances. ☐ Yes ☐ No ☒ N/A
3. Every effort has been made to decrease risk to subject(s)? ☐ Yes ☐ No ☒ N/A
4. The potential research benefits justify the risk to subject(s)? ☐ Yes ☐ No ☒ N/A
5. If subject is incompetent and surrogate consent is obtained, have all of the following conditions been met: (a) the research cannot be done on competent subjects; (b) there is no risk to the subject, or if the risk exists the direct benefit to subject is substantially greater; (c) if an incompetent subject resists, he will not have to participate; (d) if there exists any question about the subject's competency, the basis for decision on competency has been fully described. ☐ Yes ☐ No ☒ N/A
6. If the subject is paid, the payment is reasonable and commensurate with the subject's contribution. ☐ Yes ☐ No ☒ N/A
7. Members of minority groups and women have been included in the study population whenever possible and scientifically desirable. ☒ Yes ☐ No ☐ N/A

8. Comments: (Indicate if Expedited Review)

**This study was granted approval of exemption status.**

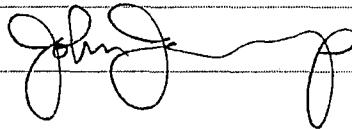
Continuing Review:

Approval Expiration: **01/06/2005**

**RECOMMENDATION:** ☒ Approve ☐ Disapprove / Revise

SIGNATURE OF CHAIRPERSON

John C. Jennings, M.D., Chairperson



DATE

01/12/2004

APPENDIX E  
CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO  
INSTITUTIONAL REVIEW BOARD APPROVAL





**CALIFORNIA STATE UNIVERSITY  
SAN BERNARDINO**

5500 University Parkway, San Bernardino, CA 92407-2397

January 23, 2004

Mr. M. Luther Borgardt  
c/o: Prof. Susan Lloyd  
Department of Nursing  
California State University  
5500 University Parkway  
San Bernardino, California 92407

**CSUSB  
INSTITUTIONAL  
REVIEW BOARD**  
Exempt Review  
IRB# 03061  
Status  
**APPROVED**

Dear Mr. Borgardt:

Your application to use human subjects, titled, "Determining the Attitudes of Registered Nurses Towards the Use of Computers" has been reviewed and approved by the Institutional Review Board (IRB) of California State University, San Bernardino.

You are required to notify the IRB if any substantive changes are made in your research prospectus/protocol, if any unanticipated adverse events are experienced by subjects during your research, and when your project has ended. If your project lasts longer than one year, you (the investigator/researcher) are required to notify the IRB by email or correspondence of *Notice of Project Ending* or *Request for Continuation* at the end of each year. Failure to notify the IRB of the above may result in disciplinary action. You are required to keep copies of the informed consent forms and data for at least three years.

If you have any questions regarding the IRB decision, please contact Michael Gillespie, IRB Secretary. Mr. Gillespie can be reached by phone at (909) 880-5027, by fax at (909) 880-7028, or by email at [mgillesp@csusb.edu](mailto:mgillesp@csusb.edu). Please include your application identification number (above) in all correspondence.

Best of luck with your research.

Sincerely,

Joseph Lovett, Chair  
Institutional Review Board

JL/mg

cc: Prof. Susan Lloyd, Department of Nursing

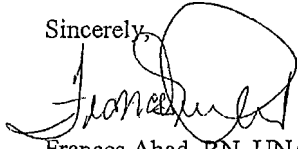
APPENDIX F  
UNITED NURSES ASSOCIATION OF  
CALIFORNIA STUDY APPROVAL

12/22/03

To Whom It May Concern:

I have met with Luther Borgardt, RN, regarding the proposed study "Determining the Attitudes of Registered Nurses Towards the Use of Computers." He has presented me with the study protocol, the introductory letter, and the protocol survey. After reviewing the documents and having my questions answered, as a spokesperson for UNAC, I grant Mr. Borgardt permission to conduct the study as outlined in the protocol.

Sincerely,

A handwritten signature in cursive script, appearing to read "Frances Abad". The signature is written in dark ink and is positioned above the printed name.

Frances Abad, RN, UNAC Secretary.

APPENDIX G  
INTRODUCTORY LETTER AND CONSENT

Registered Nurse:

This letter is to ask for your participation in a study that is part of a Masters in Nursing thesis. This study is designed to investigate the attitudes of Registered Nurses towards the use of computers. Luther Borgardt, RN is conducting the research under the supervision of Dr. Susan Lloyd, RN, Ph.D., in the Department of Nursing at California State University, San Bernardino. The Institutional Review Boards at Jerry L. Pettis Memorial VA Medical Center, California State University, San Bernardino, and the United Nurses Association of California have approved this study.

In this study you will be asked to complete a questionnaire regarding your attitude towards the use of computers. The questionnaire contains 20 statements. Please circle the response that best reflects your attitude towards the particular statement. On the second page of the survey, please complete the demographic data. The survey should take about **5** minutes to complete.

Once you have completed the survey, please use the self-addressed envelope and place it in your unit's out-going mailbox. Please return within one week of receipt.

In order to protect confidentiality, please do not write your name on the survey. All of your responses will be held in the strictest confidence by the researchers. All data will be reported in group form only. Results of this study will be available at the CSUSB Library in September 2004.

Your participation in this study is totally voluntary. You are free not to answer any questions. If you choose not to participate, it will not affect your employment. There are no added benefits or risks involved in participating in the study. Completing the survey and returning it assumes your consent.

If you have any questions or concerns about this study, please feel free to contact Luther Borgardt, RN at (909) 825-7084 x1696 or Dr. Susan Lloyd, RN, Ph. D. at (909) 880-7627.

Sincerely,

Luther Borgardt, RN

APPENDIX H  
CERTIFICATE OF COMPLETION FROM THE COLLABORATIVE  
INSTITUTIONAL REVIEW BOARD TRAINING  
INITIATIVE ON PROTECTION OF  
HUMAN RESEARCH SUBJECTS  
TRAINING

-----Original Message-----

**From:** Johnson, Earl H. [mailto:EJohnson4@med.miami.edu]

**Sent:** Wednesday, December 24, 2003 9:25 AM

**To:** luther.borgardt@med.va.gov

**Subject:** CITI Certificate of Completion

## CITI THE COLLABORATIVE IRB TRAINING INITIATIVE

**TO:** Whom it may concern

**FROM:** The Collaborative IRB Training Initiative (CITI)

**RE:** Luther Borgardt, ID number: 17  
at 531-20-VA (VA facility No.-VISN-VA)

eMAIL: luther.borgardt@med.va.gov

The CITI records confirm that, Luther Borgardt has successfully completed the required modules (1-9, 11-14) in Version 4.0 of the CITI Course in The Protection of Human Research Subjects on 12/24/2003.

This comprehensive web-based training program consists of 12 required modules and encompasses the VHA Office of Research and Development educational requirements specified by the memorandum dated March 14, 2001. Two optional modules (10,14) are also provided. Quizzes are associated with each required module and an aggregate score of 75% correct on the 12 required quizzes is sufficient for a successful completion. This course requires 4-6 hours to complete.

The CITI Course in The Protection of Human Research Subjects contains the following content.

Module 1: History and Ethical Principles

Module 2: Basic Institutional Review Board (IRB) Regulations and Review Process

Module 3: Informed Consent

Module 4: Social and Behavioral Research

Module 5: Research involving Records

Module 6: Genetic Research in Human Populations

Module 7: Research with Protected Populations - Vulnerable Subjects: A Definition

Module 8: Research Involving Prisoners

Module 9: Research involving Children

Module 11: Population Risks, Group Harms, Community Consultation, and IRB Review -

Research with American Indian, Alaska Native, and Other Socially Vulnerable Populations

Module 12: FDA Regulated Research

Module 13: Research Protections in the Department of Veterans Affairs

Module 14: HIPAA and Human Subjects Research

All learners are instructed to keep a copy and submit this letter to their Research Office or the ACOS/R&D.

Confirmation of course completion can be achieved by sending an email inquiry to CITI at CITISupport@med.miami.edu or by calling 305-243-7970.

Paul G. Braunschweiger Ph.D.

12/24/2003

Dir. UM Office of Research Education

CITI Web Site Administrator

APPENDIX I  
CERTIFICATE OF COMPLETION OF GOOD CLINICAL  
PRACTICES AND HUMAN SUBJECT  
PROTECTION TRAINING





*Employee Education System*

## **Certificate of Completion**

*This is to certify that*

**Luther Borgardt**

has completed a course entitled

**Good Clinical Practice Web Training**

VA Employee Education System is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation. VA Employee Education System designates this educational activity for 2.4 contact hours in continuing nursing education.

*The Employee Education System maintains responsibility for the program.*

This On-Line Course was completed on Dec 22, 2003



Joy W. Hunter

BES Chief Learning Officer, VA Learning University

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